I-93 Manchester to Salem
Expert Panel Analysis

Final Report

December 28, 2001
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Prepared for

The New Hampshire Department of Transportation

Prepared by

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INTRODUCTION

This document contains a summary of the work carried out by the expert panel for the I-93 Manchester – Salem Expert Panel Analysis. Their analysis was done in two phases. During Phase I, the panel allocated population and employment for a 2020 No-build alternative to 29 municipalities in the I-93 study area (Figure 2, below, shows the municipalities). The panel used the 'No-build' allocations as a base case for Phase II, in which the panel allocated population and employment for a 2020 Build alternative.

The panel met to discuss their Phase II work on December 5, 2001. The next section of this report contains material that was suggested by the panel at that meeting, as well as findings from their work.[1] A list of the members of the panel may be found in the last Appendix to this report.

FINDINGS AND RESULTS

The work carried out for Phase I of the I-93 Expert Panel analysis provided a base case for Phase II, in which the panel analyzed population and employment for the Build Alternative. The Build Alternative consists of a four-lane highway in both directions between Salem and Manchester, the reconstruction of the five interchanges, but no additional interchanges. These findings highlight key issues from the panel's work in Phase II, including a discussion of the variation in the panelists' allocations and a synthesis of the panelists' assumptions. It also presents a comparison to current population and employment figures as well as to the results from Phase I (in which the No-build Alternative was analyzed).

<u>Panelists' Blended Average Allocation</u>

In order to discuss the panel's work as a group – i.e., to describe the level of population and employment that the panel as a whole allocated to a given municipality, it is convenient work with a single number. We have created the Panelists' Blended Average Allocation for this purpose, a number which represents a "blended average" of the panel's allocations. Rather than use the average (the mean) across responses or the median across responses, we create a "blended average" using the two as shown below:

$$(\text{Mean} + \text{Median})/2$$

This measure allows extreme values to be given some weight (unlike a median) but not as much weight as they are given with the mean. More details about the derivation of the Panelists' Blended Average Allocation can be found in the next-to-last Appendix to this report.

Note that, during the December 5th meeting, the panel emphasized that this measure of central tendency should not be considered a "consensus allocation." The panel did not feel that they reached consensus. The panel preferred to say that they have "informed opinions" which cross a broad spectrum. The idea of having a single number to summarize their work is something of an

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[1] The panel met at two additional times: on June 29, 2001 to begin the study and on October 17 to discuss their Phase I work.

artificial device in order to provide another measure by which to consider the findings and to assess the implication relative to secondary impacts.

Study Area Allocations

The panel's Blended Average Allocation (PBAA) results in a total of 784,000 people and 419,000 jobs in the study area for the 2020 Build Alternative. This is a population increase of 30 percent from today and a 40 percent increase for employment.

If we look at just the difference between the No-build and Build alternatives for the PBAA, the Build PBAA has 40,600 more people than the No-Build and 21,500 more jobs, a five percent difference. Current levels of population and employment are graphed in Figure 1, below, along with the PBAA for the No-build and Build Alternatives.[2] The difference between No-build and Build PBAA are mapped in Figures 2 and 3, below, followed by maps showing the percent change from the No-build to Build in Figures 4 and 5. Finally, the PBAA for each municipality is shown in Table 1, following the Figures.

Please note: the PBAA for the study area as a whole is derived by adding up the individual PBAAs for each municipality as opposed to creating it using the study area mean and median.

Figure 1: Population and Employment, Current, Plus 2020 Panelists' Blended Average Allocations for No-Build and Build

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[2] The increase from current levels to the 2020 No-build is just over 138,000 for population and just over 99,000 for employment. This represents increases of 23 and 33 percent, respectively.
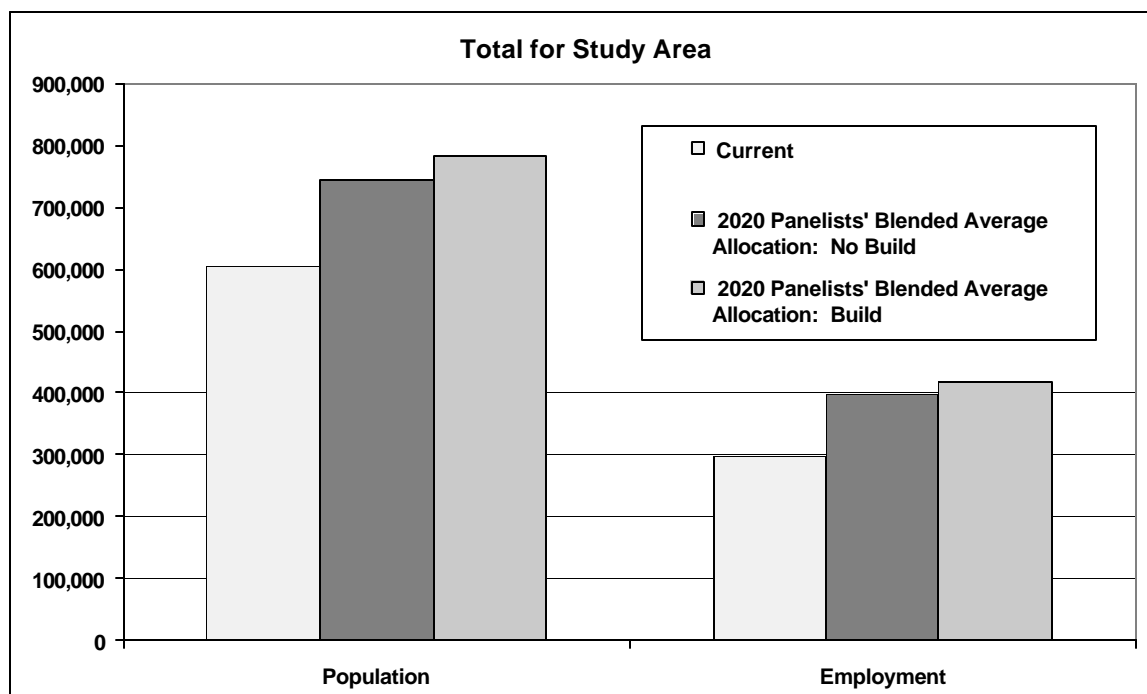
Two panelists opted to allocate growth to three additional municipalities: Boscawen, Canterbury, and Loudon; and one of the two included allocations for three additional regions: North Country

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Council, Lakes Region RPC, and Upper Valley Lake Sunapee RPC. The allocations for these places are graphed at the end of Appendix D. Because only one panelist carried out an allocation for both the No-Build and Build alternatives for the three municipalities , we can only offer a comparison for them, as follows. Fairly modest growth was allocated for Boscawen, Canterbury, and Loudon in both absolute and percentage terms. Population and employment increases from the 2020 No-build to the 2020 Build were on the order of 50 to 300 persons and jobs. With the exception of Canterbury's employment, which was given an increase of 86 percent for the Build Alternative relative to the No-build, the remaining municipalities were increased by four percent.

Municipal Allocations

- In general, smaller municipalities that are off the study corridor tend to have been allocated the largest percent increase when comparing the 2020 Build Allocation for population to the No-build Allocation. Auburn was the highest, at 24 percent, followed by Candia and Atkinson (19 and 14 percent, respectively).

- Similar to population, it was the smaller places off the study corridor that were allocated the largest percent increase when comparing the 2020 Build Allocation for employment to the No-build Allocation. Candia was the highest, at 34 percent, followed by Dunbarton and Atkinson (33 and 30 percent, respectively).

- In contrast, the municipalities with the largest absolute change in population, from the 2020 No-build to the 2020 Build tend to be on the I-93 corridor and are among the larger places in terms of current population. Londonderry, Manchester, and Derry were the top three municipalities for absolute population change from the No-build to the Build Alternative (ranging from increases of almost 3,000 to just over 4,000).

- Looking at employment, it is the places with the largest current employment that received the largest absolute difference between the 2020 No-build and the Build Panelists' Blended Average Allocations. Manchester, Methuen, and Concord were the top three recipients comparing the increment between the No-build and Build Panelists' Blended Average Allocations (ranging from 1,400 to almost 6,000).

- Six municipalities, most of which are on the I-93 corridor itself, account for over half (54 percent) of the current population in the study area as a whole (Andover, Derry, Concord, Methuen, Lawrence, and Manchester). The Panelists' Blended Average Allocations for the 2020 Build Alternative give these places about 50 percent of future population. The No-build Panelists' Blended Average Allocation from Phase I gave these municipalities 51 percent of the study area's population.

- Five municipalities account for 68 percent of current employment (North Andover, Lawrence, Methuen, Concord, Manchester). The Panelists' Blended Average Allocations for the 2020 Build Alternative give these places about 64 percent of future employment. The No-build Panelists' Blended Average Allocation from Phase I gave these municipalities 65 percent of the study area's employment.

- Finally, five municipalities are located at interchanges along I-93, in the study corridor: Salem, Windham, Londonderry, Derry and Manchester. We looked to see if any trends could be found in how the panel allocated population and employment growth to these places. We found that Derry, Manchester, and Londonderry shared the top three positions in absolute population growth from the 2020 No-build Allocation to the 2020 Build Allocation (note that these were also the top three places for the population increase from current levels to the Build alternative as well as from current to No-build).

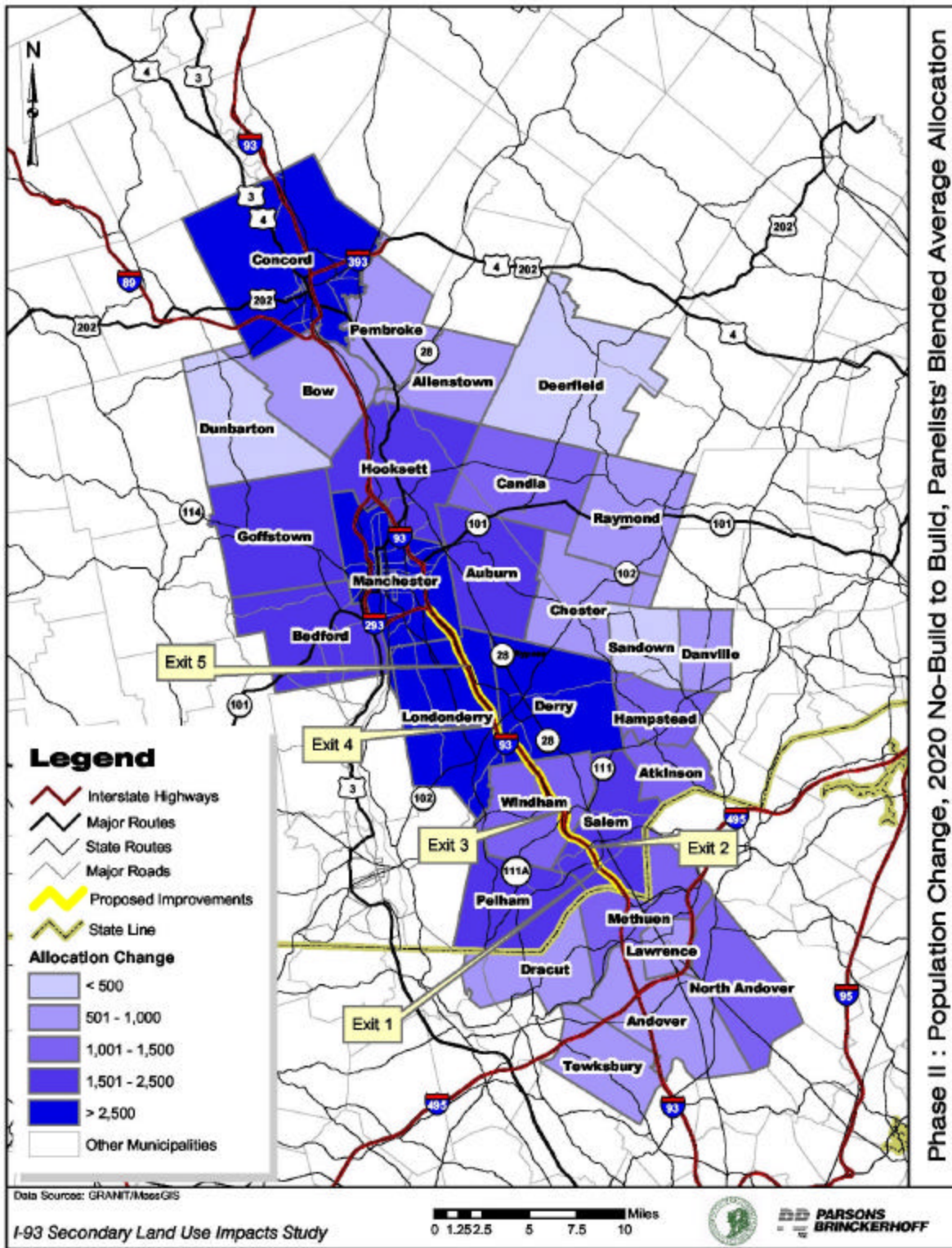**Figure 2: Population Difference, 2020 No-build to 2020 Build**

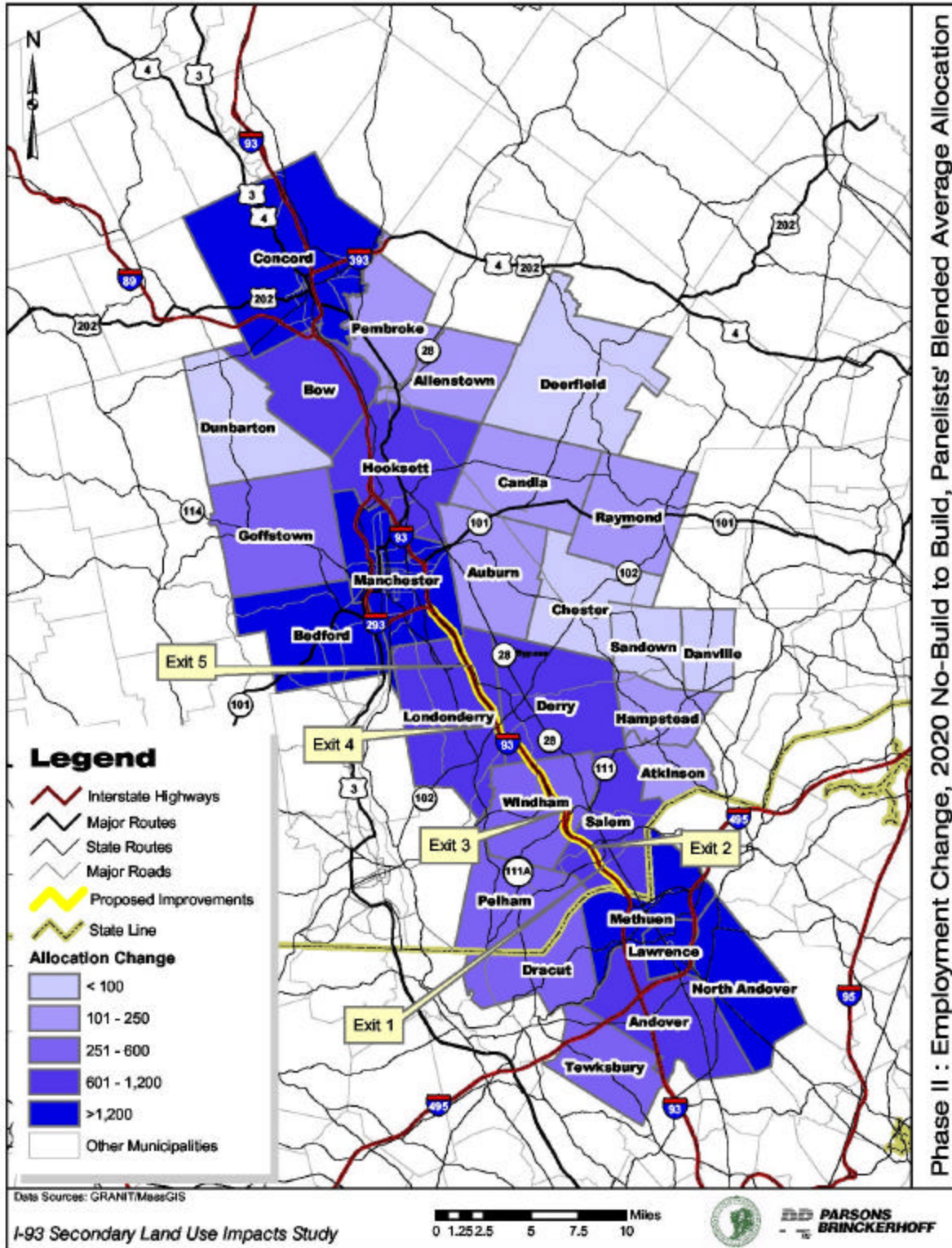**Figure 3: Employment Difference, 2020 No-build to 2020 Build**

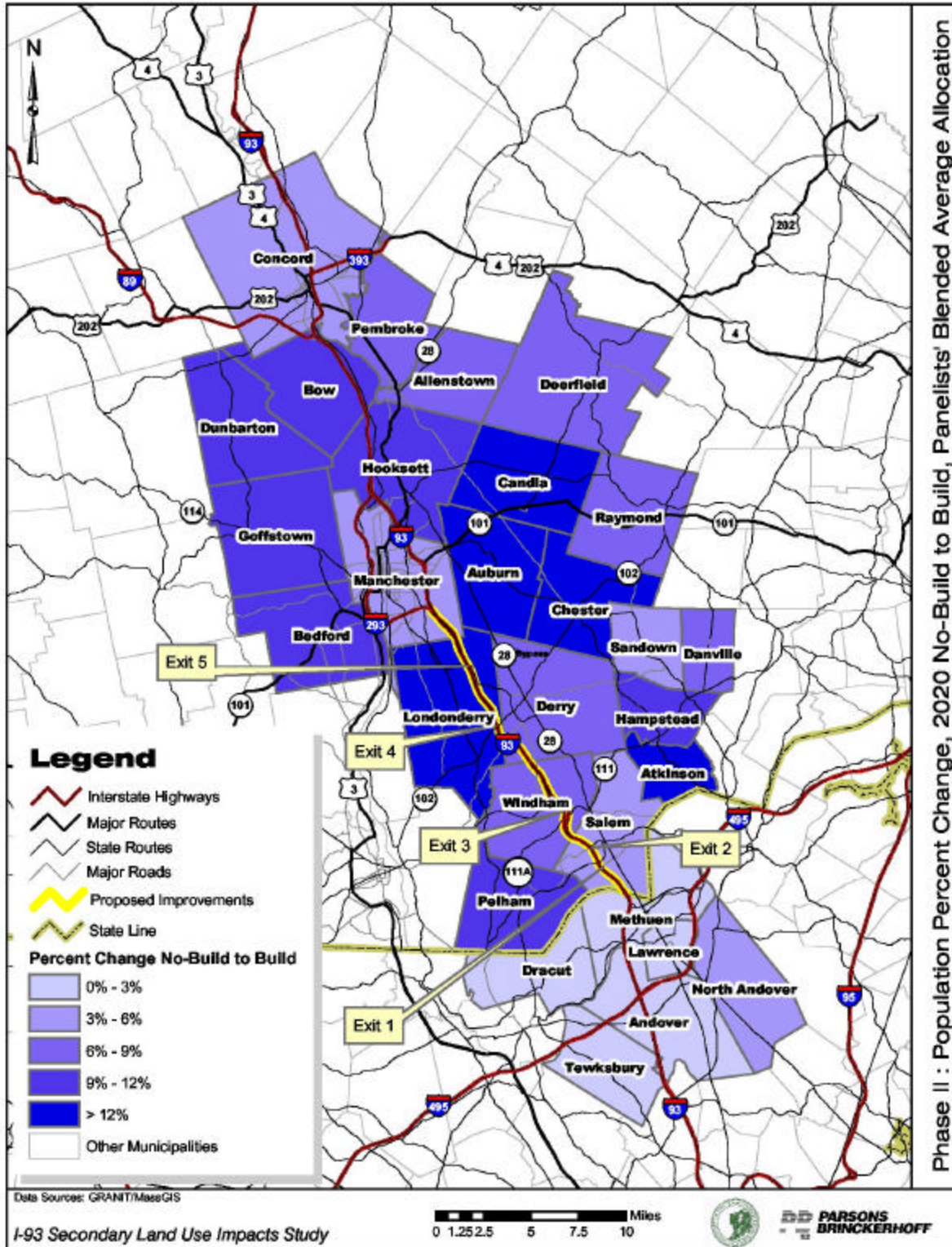**Figure 4: Population Percent Change, 2020 No-build to 2020 Build**

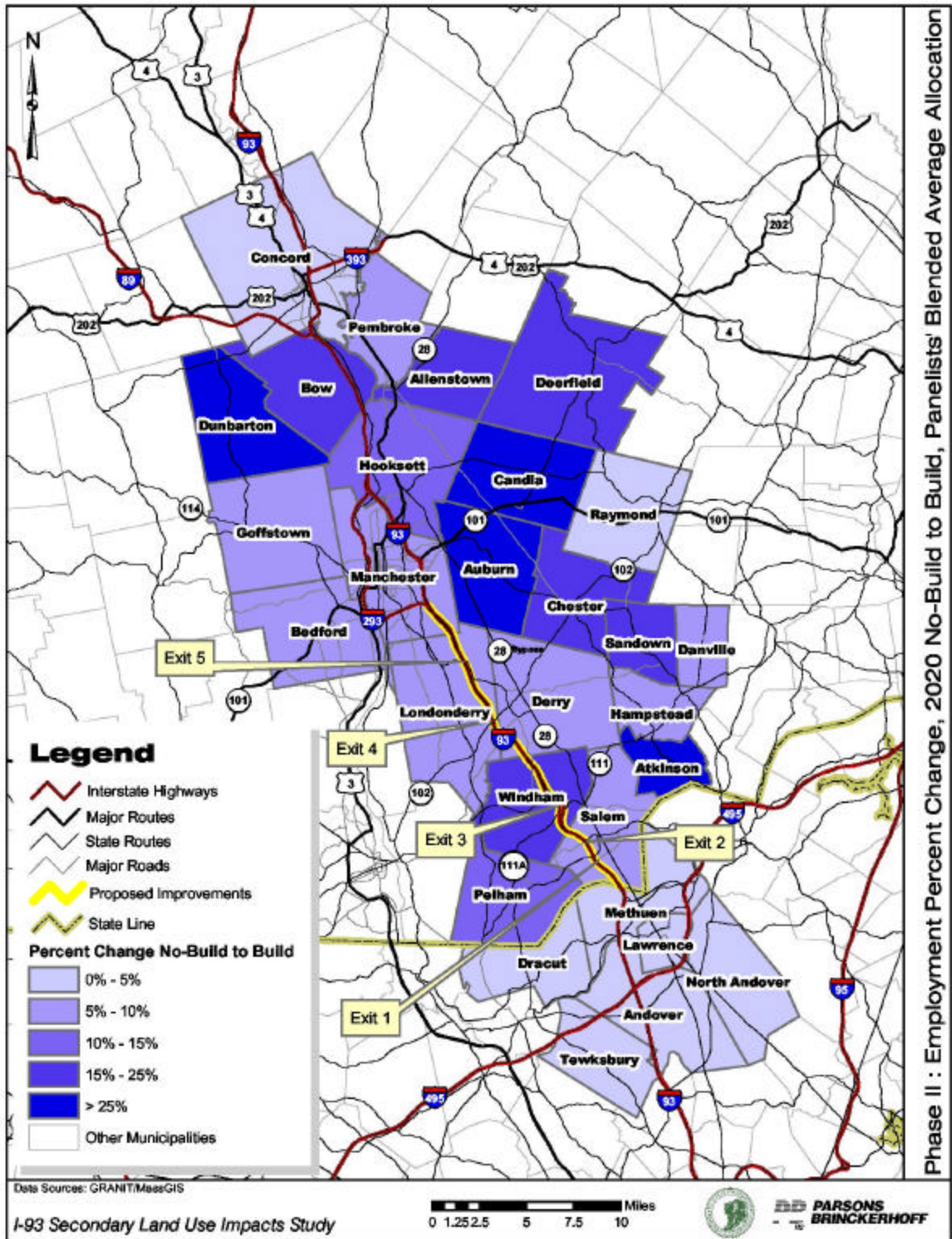**Figure 5: Employment Percent Change, 2020 No-build to 2020 Build**

Table 1: Population and Employment, Current and 2020 PBAA

		POPULATION			EMPLOYMENT		
			PBAA			PBAA	
		Current	2020 No-Build	2020 Build	Current	2020 No-Build	2020 Build
1	Allenstown	5,000	5,971	6,472	400	610	711
2	Andover	31,000	36,999	37,616	18,000	22,718	23,705
3	Atkinson	6,000	8,573	9,757	400	673	875
4	Auburn	5,000	7,133	8,865	400	825	1,047
5	Bedford	18,000	24,906	27,186	12,000	19,932	21,300
6	Bow	7,000	9,264	10,237	3,000	4,339	5,003
7	Candia	4,000	5,408	6,425	300	449	601
8	Chester	4,000	5,623	6,369	200	323	400
9	Concord	41,000	48,253	50,997	45,000	59,609	61,052
10	Danville	4,000	5,584	6,085	200	319	340
11	Deerfield	4,000	5,543	5,989	200	321	383
12	Derry	34,000	44,706	47,672	7,000	9,009	9,876
13	Dracut	29,000	34,018	34,676	7,000	9,268	9,651
14	Dunbarton	2,000	2,765	3,061	100	214	284
15	Goffstown	17,000	21,394	23,328	3,000	4,523	4,913
16	Hampstead	8,000	12,520	13,970	1,000	1,870	2,041
17	Hooksett	12,000	15,794	17,455	6,000	8,555	9,497
18	Lawrence	72,000	80,501	81,429	31,000	38,332	39,583
19	Londonderry	23,000	33,069	37,250	8,000	11,700	12,583
20	Manchester	107,000	117,672	121,438	60,000	82,182	87,883
21	Methuen	44,000	50,917	52,304	35,000	41,691	43,355
22	North Andover	27,000	31,842	32,856	31,000	36,391	37,644
23	Pelham	11,000	16,973	18,911	2,000	2,800	3,165
24	Pembroke	7,000	8,866	9,570	2,000	2,941	3,095
25	Raymond	10,000	13,723	14,600	2,000	3,313	3,464
26	Salem	28,000	37,774	39,587	13,000	17,864	19,008
27	Sandown	5,000	7,814	8,174	100	209	251
28	Tewksbury	29,000	34,392	35,100	9,000	14,359	14,696
29	Windham	11,000	15,047	16,294	1,000	1,986	2,446
	TOTAL	605,000	743,044	783,673	298,300	397,325	418,852

Variation

In addition to the PBAA, which expresses the "blended average" of the panelists' allocations for each municipality, it is important to look at the amount of variation that exists in the panel's work. We look at variation by using the minimum and maximum allocations and comparing their range to the PBAA. Figure 6, below, shows the PBAA, Minimum, and Maximum Allocation for the study area as a whole (similar graphs for each municipality may be found in the Phase II Appendices to this report).

The panel showed slightly more agreement for the employment allocation as a whole than for population. That is, for the entire study area, there was more variation among the allocations for population that among those for employment; the range for population is 34 percent of the PBAA for population while the range for employment is 21 percent of its PBAA.

Figure 6: 2020 Build PBAA, Plus Minimum and Maximum Allocations
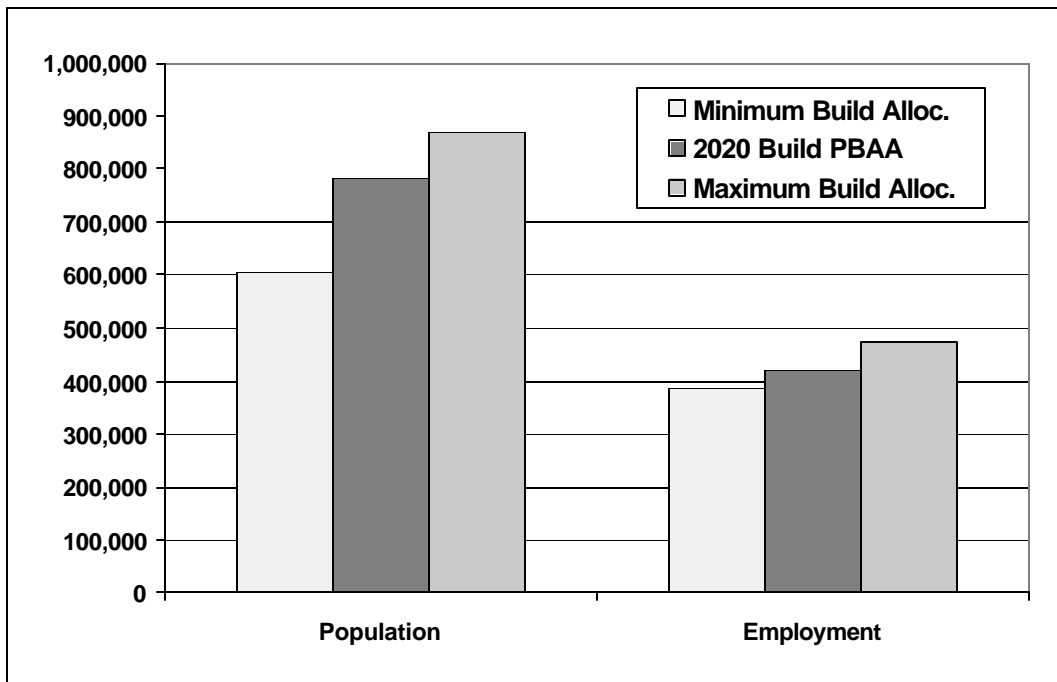
Individual municipalities have differing levels of variation. For the population allocations, 12 places – Auburn, Bow, Chester, Danville, Deerfield, Hampstead, Hooksett, Londonderry, Pelham, Raymond, Salem, and Sandown – fit the criteria of having a large variation among the panelists.[3] These places comprise 20 percent of the current population of the study area.

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[3] In order to look at the variation in each municipality, we first identified places for which the Range was greater than 50 percent of the Panelists' Blended Average Allocation. We then dropped all instances in which the absolute amount of the Allocation was less than 2,000. Note that this method is slightly different from the one used for Phase I. At the request of the panelists during the December 5th meeting, we no longer drop places for which a large variation can be accounted for by one panelist.

For the employment allocations, there were 11 municipalities with a large variation – Derry, Goffstown, Hampstead, Hooksett, Londonderry, Pelham, Pembroke, Raymond, Salem, Tewksbury, and Windham. These places comprise 18 percent of current employment for the study area.

More information on variation, including statistics and graphs for each municipality, may be found in the Phase II Appendices to this report.

Panel Assumptions

Each of the 14 panelists provided comments along with their respective population and employment growth allocations for the 2020 Build Alternative. These comments provided useful insight into the general assumptions that each panelist was working under in determining expected growth in the 29 communities. A brief synthesis of their assumptions was presented to the panelists at the December 5th meeting and was subsequently discussed. As part of the discussion, the panelists "voted" on two issues for each assumption shown in Table 2, below. They first indicated (by a raised hand) whether they agreed with the statement; the result of this vote is shown in the middle column. Second, they voted on whether or not they considered the assumption when carrying out their own allocations; the results of this are shown in the final column. Please note that 11 panelists attended the meeting.

Table 2: Panelists' Assumptions from Phase II

Assumption	Number of Panelists Agreeing with this Assumption (out of 11)	Number of Panelists who used this Assumption in Allocation (out of 11)
Local planning policies and zoning laws will impact the amount of population and employment growth a community will incur	11	11
In the study area the improvement of I-93 in conjunction with local planning can be an economic development tool	11	6
Growth is dependent on a wide variety of factors that we don't know completely	11	6
High degree of uncertainty about own allocation due to unforeseen issues or situations	5	3
Water supplies may not be adequate in specific communities to accommodate allocated growth	6	2
Possible inadequacies in water supply could push growth into other communities with adequate water	10	2
Widening will be significant to the economic growth of the middle and northern parts of New Hampshire	7	2*
A secondary impact of the improvements would be a widening of I- 93 to Concord which would further increase traffic on that corridor	2	2
The personal use of vehicles on highways will be the major mode of transportation over the 20 year period	10	10
Telecommuting will be of greater importance in the future leading to more population growth off the corridor.	7	2

 * Note that only two panelists carried out allocations for the middle and northern parts of New Hampshire.

In addition to the discussion on assumptions, there were issues that several panelists felt should be emphasized in this document. We note these below:

- A number of panelists commented that the focus of the process – that of allocating population and employment figures to municipalities – was not an ideal way of analyzing the land use implications of changes to I-93 because it focused only indirectly on land use. These

panelists noted that they carried out the allocations as requested for the process, but that they feel that it represented a "second best" approach to land use and land consumption.[4]

- The process that the panel engaged in did not permit them to address the issue of *where* the people and jobs go within municipalities and the way in which land is developed for them. Although these issues will be addressed in the Environmental Impact Statement that will subsequently be prepared, several panelists felt it would have been better if they had had a more direct say in this issue.

- Several panelists felt that a rail corridor could be important to the corridor and could affect land use allocations as well as auto usage. Not including rail as part of the analysis made the analysis less useful.

- A couple of panelists commented that the present report deals with a specific set of questions and should not be used outside of these questions.

- A panelist noted that it is important to monitor land use changes over time in the study area. Any "forecast" needs revision, and without more current data on land use, this is not possible.

[4] Note: land consumption will be addressed directly in the EIS.

PHASE I SUMMARY

The following points highlight key issues from the panel's work in Phase I, during which they analyzed the population and employment effects of a No-build alternative.

Panelists' Blended Average Allocation

For the study area as a whole, the panel allocated an increase in population of just over 138,000 and an increase in employment of just over 99,000 over current levels by the year 2020 for the No-build Alternative, as shown in Figure 7, below. This represents increases of 23 and 33 percent, respectively. These increases are mapped in Figures 8 and 9, below. The PBAA for each municipality is shown in Table 3, following the Figures.

Figure 7: Population and Employment, Current and the 2020 No-build PBAA
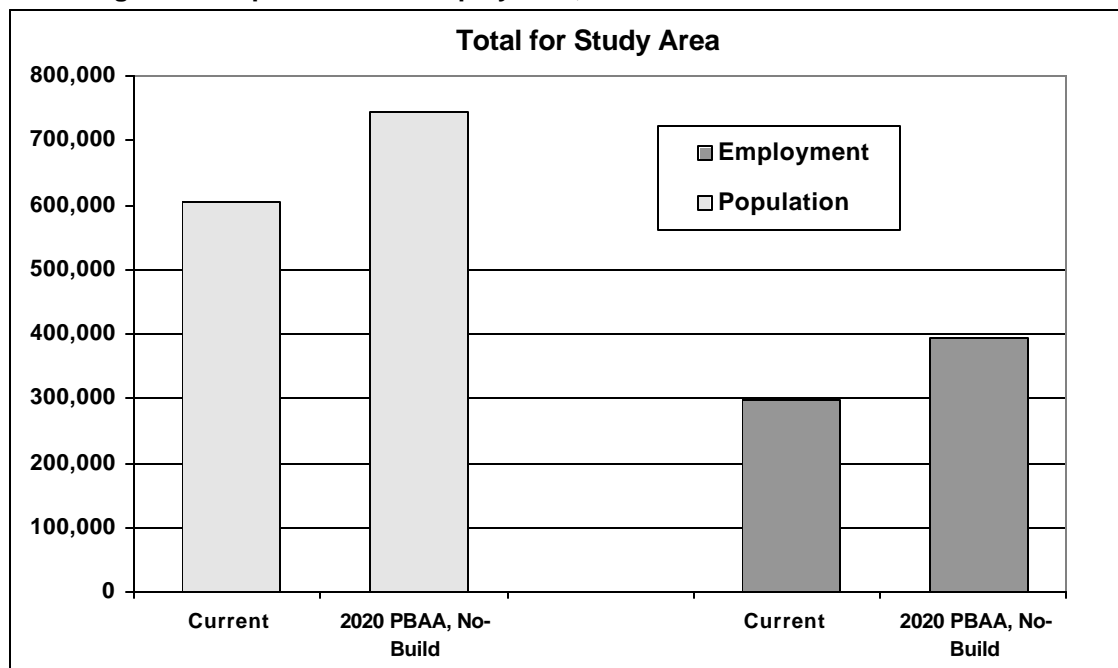
Changes at the Municipal Level

- The PBAA indicates that population will remain focused along the I-93 corridor itself. Today, about six municipalities account for over half (54 percent) of the current population in the study area as a whole (Andover, Derry, Concord, Methuen, Lawrence, and Manchester). These same municipalities, are forecast to have 51 percent of the population in 2020, as represented by the PBAA. These six places are forecast to increase from a total of 329,000 people to 379,000, or a 15 percent increase.

- Employment also remains focused on the corridor. Just five municipalities account for 68 percent of current employment (North Andover, Lawrence, Methuen, Concord, Manchester). In 2020, the PBAA gives these same municipalities 65 percent. These five places are forecast to increase from a current total of 202,000 jobs to 258,000 in 2020, or a 28 percent increase.

- The places growing the most quickly, in terms of percent change, tend to be smaller and more distant from the corridor. Eight municipalities are forecast to grow in population by 40 percent or more (Danville, Chester, Auburn, Atkinson, Londonderry, Pelham, Sandown, Hampstead). Aside from Londonderry and Pelham, with 23,000 and 11,000 in population respectively, the remaining municipalities currently have 4,000 to 8,000 people. These places represent about 11 percent of the current population and 13 percent of the forecast for the study area.

- Eleven municipalities are forecast by the panel to grow in employment by 60 percent or more (Tewksbury, Deerfield, Chester, Raymond, Bedford, Atkinson, Hampstead, Windham, Auburn, Sandown, and Dunbarton). Each of these are, with the exception of Windham, off of the I-93 corridor. Most currently have 1,000 jobs or less (with the exception of Tewksbury, Raymond, and Bedford). Although growing quickly, these places currently account for only 8 percent of the jobs in the study area and are forecast to grow to a total of 11 percent.

Figure 8: 2020 No-build Panelists' Blended Average Allocation versus Current Population
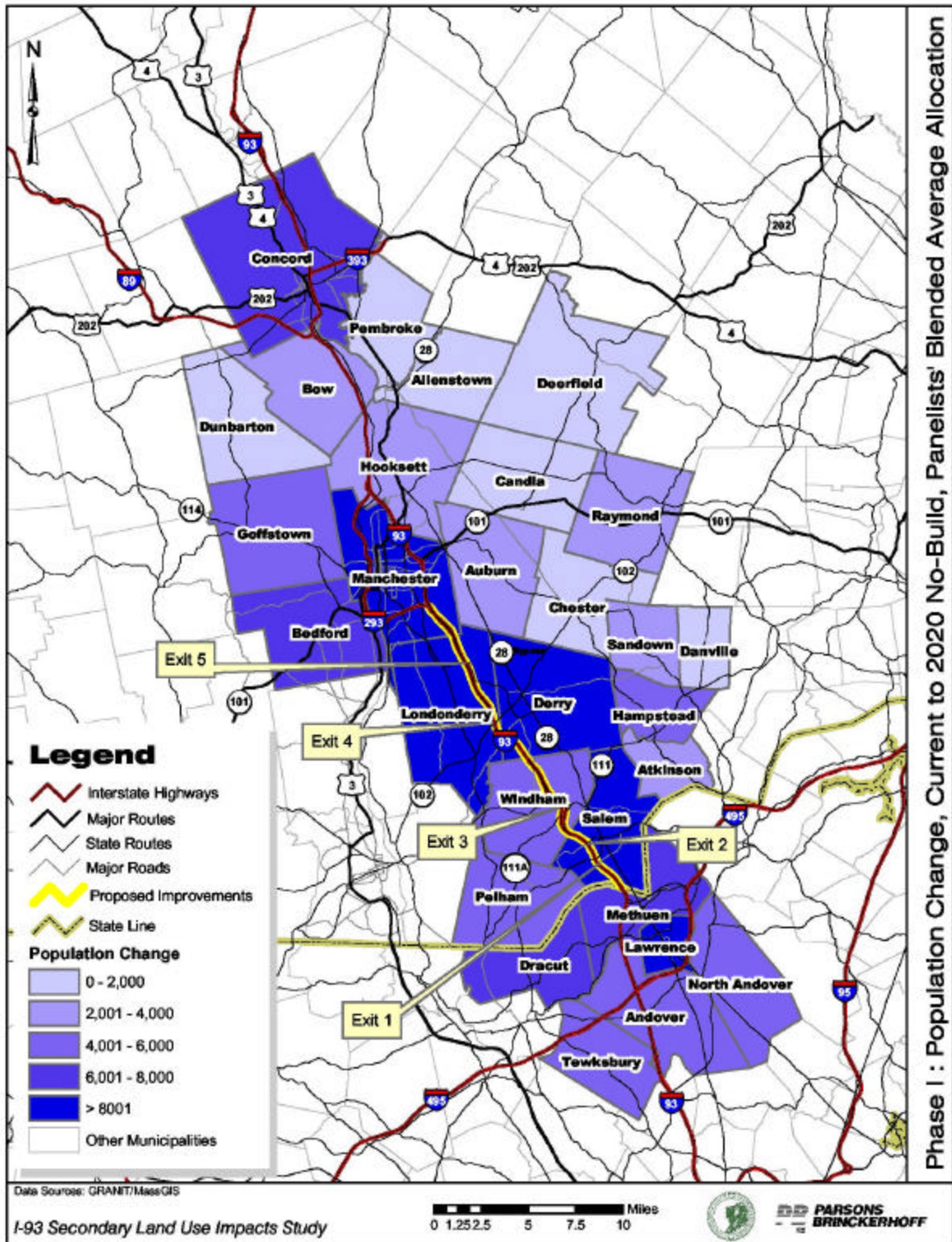
Figure 9: 2020 No-build Panelists' Blended Average Allocation versus Current Employment
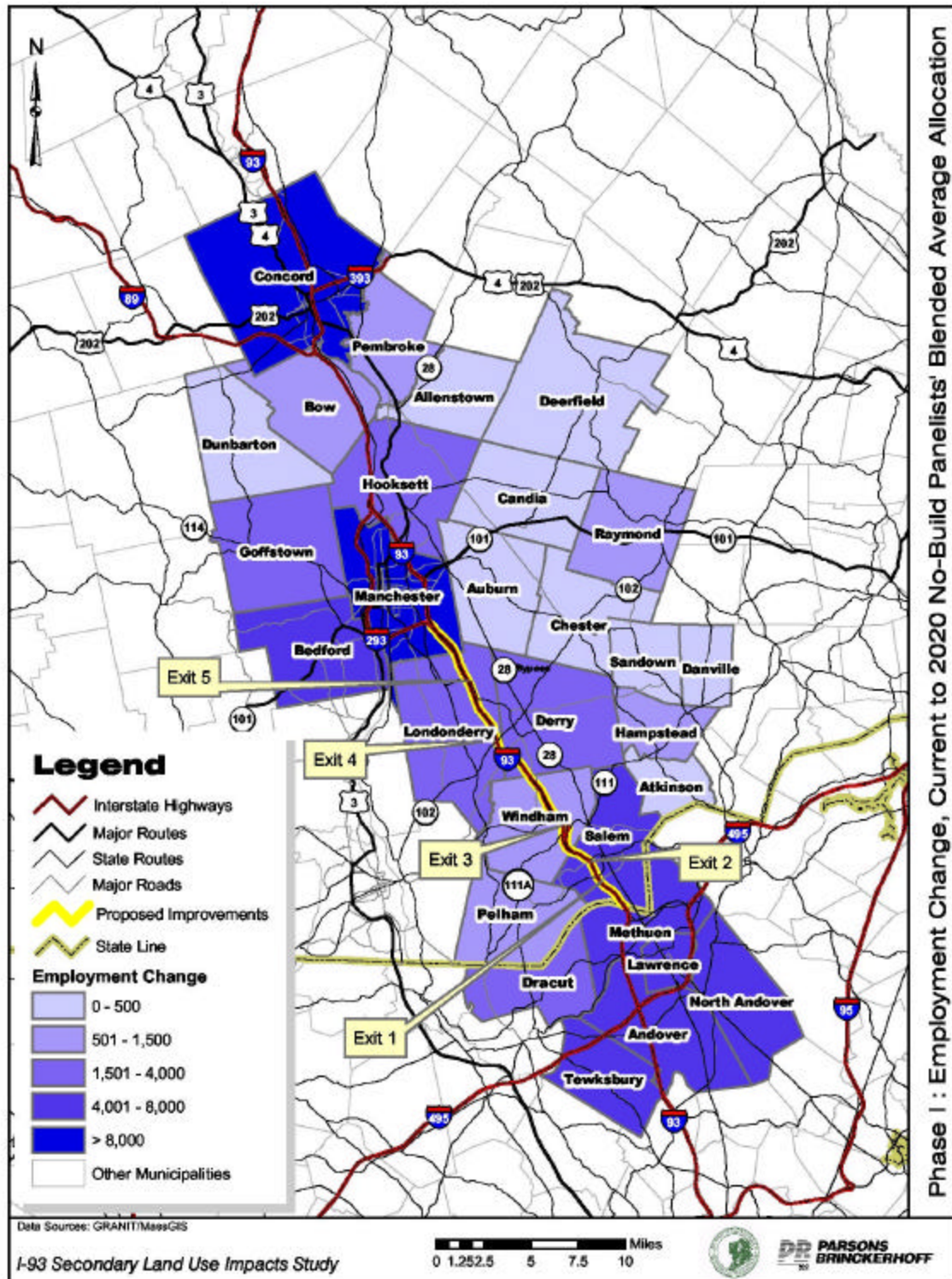
Table 3: Population and Employment, Current, 2020 No-build PBAA, and Range

	Municipality	Population			Employment		
		Current	*Allocation*	*Range*	*Current*	*Allocation*	*Range*
1	**Allenstown**	5,000	5,971	2,700	400	610	600
2	**Andover**	31,000	36,999	21,000	18,000	22,718	12,000
3	**Atkinson**	6,000	8,573	6,000	400	673	800
4	**Auburn**	5,000	7,133	2,500	400	825	4,600
5	**Bedford**	18,000	24,906	10,150	12,000	19,932	6,000
6	**Bow**	7,000	9,264	7,600	3,000	4,339	3,250
7	**Candia**	4,000	5,408	3,500	300	449	600
8	**Chester**	4,000	5,623	3,290	200	323	400
9	**Concord**	41,000	48,253	6,660	45,000	59,609	14,600
10	**Danville**	4,000	5,584	4,810	200	319	390
11	**Deerfield**	4,000	5,543	1,900	200	321	400
12	**Derry**	34,000	44,706	14,000	7,000	9,009	4,600
13	**Dracut**	29,000	34,018	5,395	7,000	9,268	5,800
14	**Dunbarton**	2,000	2,765	1,350	100	214	250
15	**Goffstown**	17,000	21,394	6,000	3,000	4,523	2,900
16	**Hampstead**	8,000	12,520	3,300	1,000	1,870	1,500
17	**Hooksett**	12,000	15,794	17,400	6,000	8,555	5,600
18	**Lawrence**	72,000	80,501	14,180	31,000	38,332	8,700
19	**Londonderry**	23,000	33,069	11,135	8,000	11,700	7,500
20	**Manchester**	107,000	117,672	17,000	60,000	82,182	23,000
21	**Methuen**	44,000	50,917	14,000	35,000	41,691	13,000
22	**N. Andover**	27,000	31,842	11,600	31,000	36,391	9,000
23	**Pelham**	11,000	16,973	6,400	2,000	2,800	2,900
24	**Pembroke**	7,000	8,866	5,475	2,000	2,941	1,900
25	**Raymond**	10,000	13,723	8,400	2,000	3,313	4,000
26	**Salem**	28,000	37,774	9,220	13,000	17,864	10,000
27	**Sandown**	5,000	7,814	2,700	100	209	250
28	**Tewksbury**	29,000	34,392	8,100	9,000	14,359	14,100
29	**Windham**	11,000	15,047	5,500	1,000	1,986	4,800
	TOTAL	**605,000**	**743,044**	**161,200**	**298,300**	**397,325**	**97,005**

Variation

One way to look at the level of agreement among the panelists' allocations is to compare the Range (the maximum allocation minus the minimum) to the PBAA. For the study area as a whole, the Range represented 22 percent of the population allocation and 24 percent of the employment allocation. The PBAA and Range is shown for each municipality in Table 1, above, and is shown in a graph for the study area as a whole in Figure 10, below.

Figure 10: 2020 No-build Panelists' Blended Average Allocation and Range for the Study Area
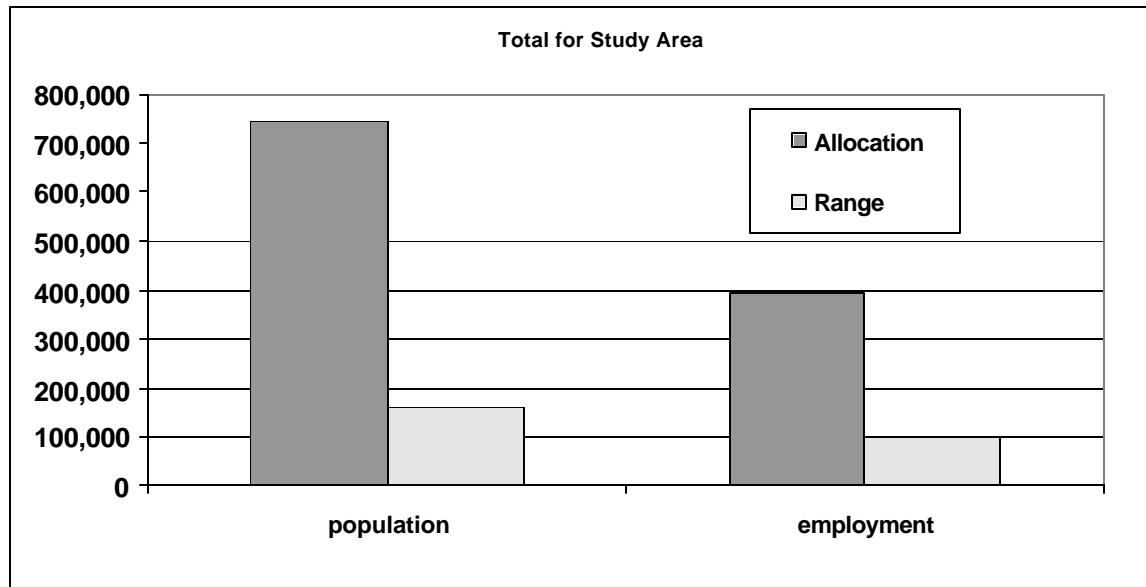
There were several municipalities in which we identified a large amount of variation in the panelists' allocations.[5] In all cases, the large variations were for employment allocations. The municipalities for which we identified a large amount of variation in the panelists' employment allocations are: Bow, Hampstead, Hooksett, Londonderry, Pelham, and Raymond. Of these, Bow, Hooksett, and Londonderry are on the corridor while the other three are near the edge of the study area.

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[5] We identified variation by looking at the municipalities for which the Range represented over 50 percent of the Panelists' Blended Average Allocation for population and for employment. We then dropped all instances in which the absolute amount of the Allocation was less than 2,000. Finally, we dropped all instances for which a large Range could be accounted for by only one panelist's allocation.

PHASE II (2020 BUILD ALTERNATIVE) APPENDICES

Phase II Panel Statements

This section contains the statements written by panelists in Rounds 1 and 2 for the Build Alternative. As in Phase I, each panelist was assigned a number which is used to identify each panelist in the statements below. Note that the panel numbers for Phase II are not necessarily the same as those from Phase I.

Panelist #1, Round 1

I found it much harder to do the forecast for the build alternative, than for the no-build alternative. The no-build alternative was easy - a forecast using past trends.   New England and New Hampshire forecasts for employment and population are available, and can be adapted to provide a study area forecast. It is comparatively simple to examine how each town in the study area has grown, relative to the rest of New Hampshire, and to project that growth out into the future.

The build alternative forces one to consider how the improvement in the I-93 corridor will alter the base (no-build) case. How many more jobs will be created, and how many more people will move into the study area if the average commuting time from **Manchester** (I-293) to the Massachusetts border shrinks from 28.5 to 16.5 minutes? Will a decrease of 12 minutes in average commuting time create an extra economic benefit, as measured by a change in employment and population?

Economic impact studies suggest thinking about several types of impacts resulting from an improvement in transportation infrastructure. The key categories are:

- Construction and construction financing effects;
- Operating effects;
- Environmental effects;
- Tourism effects;
- Cost savings for businesses; and
- Cost savings (including safety improvements) for consumers and commuters.

The construction effects should not be part of the Build case, in my opinion, since we are looking at the year 2020, well past the construction phase of I-93 improvement.

The operating effects are of significance for public transportation facilities. Public transportation service would improve with the upgrade of the I-93 corridor, but I believe the 12-minute improvement would not be significant enough that it need be accounted for explicitly.

The environmental effects apply mainly to substituting public transportation for private automobile transportation. As above, I believe these impacts may net each other out, or in fact will be too small to model.

Tourism effects are important enough to be considered in economic development. As pointed out by several panelists at the October 17th I-93 Panel meeting, the improvement in the I-93 corridor

will improve access to the New Hampshire tourist destinations beyond the I-93 corridor. These would include the Lakes Region (around Lake Winnipesaukee), the White Mountains, and to a lesser degree, the Dartmouth/Lake Sunapee region. However all of these areas are outside of the study area. Despite the October 17th discussions on expanding the study area, I will leave it to other Panel members to quantify these impacts.

Cost savings to business due to highway improvements come from reduced costs. The effect of the improved roads is to reduce trucking costs. This reduction is realized by increasing productivity in the trucking industry. Productivity gains should also be considered for industries that supply their own trucking. Transportation improvements that lead to reduce costs will reduce sales prices for regional industries. However, transportation cost reductions that directly reduce sales prices are different than other price reductions. They apply equally to competing imports to the extent that they reduce costs for imports.

Therefore, the competitive response for regional industries that increase local market shares when there are reductions in sales prices must be offset by appropriate reductions in the market share when these decreases stem directly from reduced transportation costs.

This means that all local industries, and their competitors, gain an advantage when the highway system improves. While not exactly a 'zero-sum game', the point is that no industry gains a clear advantage over others in the area, simply because the highway system is improved.

Also we must consider what portion highway transportation costs are of the total cost of doing business. Studies I have seen suggest that this can vary by industry type, but probably amounts to no more than ten percent of total operating costs. Even if we knew the transportation cost of doing business by type of business, would still have to know the mix of industries in the study area, and model the reduction in transportation costs for each type.

Most of the industries in New Hampshire produce high value added, low gross weight products, such as printed circuit boards, fiber optic cable, and software. For the purposes of this study, I will assume that highway transportation costs as a percent of the total cost of doing business tends toward the low range in the study area. Therefore the I-93 corridor improvement will lower total business costs only slightly.

Consumers spend about 18% of their total household budget on transportation. The savings to automobile users from highway improvement is a reduction in cost (less commuting time) or increase in benefits (safer travel) that will not be reflected by price changes. Therefore, safer travel should be treated as an amenity gain, or an improvement in the overall quality of life in the area. This could increase the net number of migrants into the area, and have ramifications in the labor market.

Other Studies

In trying to prepare myself for this task I have been looking on the Internet for any studies that quantify the economic impacts of highway corridor improvements. I have had little luck. I have found studies examining highway projects in Hawaii, Route 30 in Lancaster County PA, the Legacy Highway in Salt Lake City and I-73 in Virginia, none of which listed any quantification of economic impacts that I could find. A study by the Indiana Department of Transportation discussed their Major Corridor Investment-Benefit Analysis System showed very small economic impacts associated with upgrading US 31, roughly about 2% change in population and employment from the no-build to the build case. Interestingly enough, the US 31 expected

percentage increase in employment and population to 2020 was very close to my own for the I-93 study area.

It is even questionable whether the economic impact (benefit) of highway improvements should be considered at all. The Federal Highway Administration, in it's Procedural Guidelines for Highway Feasibility Studies, notes:

"The issue of accounting for local and regional economic development benefits has sometimes resulted in contention within the context of feasibility studies. Typically, development benefits are essentially equivalent to a transfer payment. That is, forecasted local economic growth in the vicinity of a new transportation facility is growth that would have occurred elsewhere if the transportation facility would have occurred elsewhere. In such cases, the development benefits should not be considered in the benefit-cost calculation. Similarly, in the case of the economic impact of the construction of a new transportation facility, the jobs, etc., associated with such construction should not be considered in the benefit-cost calculation since such jobs, etc., would have occurred elsewhere if construction had occurred elsewhere. " source: *http://www.fhwa.dot.gov/hep10/corbor/feastudy.html*

Martin Weiss, Transportation Specialist with the FHWA, has referred to "the state of knowledge, bad and educated, primitive and wild, regarding economic development (associated with highway construction)". He states that the phrase 'economic development' has not been defined in transportation. However Mr. Weiss does make a point that local highway economic development studies have shown, quite decisively, that improved highways, by themselves, are not a economic development tool but that improved highways combined with other programs seem to have the power to make a difference in employment rates on a county level basis.

This is probably the most interesting point of all, especially as regards the I-93 study area. A number of the study area communities, in particular **Londonderry**, have been examining no-growth ordinances or growth moratoriums. If local economic development policies work against, rather than with, infrastructure improvements the economic gains from such improvement would certainly be less.

The Projections in the Build Case

I have taken a very simple approach to the projection in the build case. I have assumed that the build case would increase each study area town's growth by 10 percent from my no-build case. In summary this causes the total study area population and employment to be 1.5% and 2.1% higher, respectively, compared to the no-build case for the year 2020. This seems to me to be a very moderate increase in economic activity, and in the spirit of the exhortations from the Federal Highway Administration. These results also seem consistent with the Indiana study noted above, which, although a larger area than the I-93 corridor was expected to grow at about the same rate in their no-build case as in mine.

Panelist #1, Round 2

I have reviewed my fellow panelists work, and have decided <u>not</u> to revise my Build allocations. Although my projections are on the low end of the projections of the other panelists, I still believe my projections are sound.

With all due respect to the opinions of my fellow panelists, the majority of the other forecasts thus far, especially in the Build case, are extremely optimistic. The expected growth in the I-93

study area, as represented by the majority of the panelists, is simply too high, and extraordinarily high in the Build case.

Growth at high rates cannot continue forever. An examination of the population growth in the I-93 towns over the last twenty years shows that those towns that added the most people over the last 20 years grew slower in the years 1990-2000 than in the years 1980-1990. Growth represented by a plot line drawn on semi-log paper is simply not rational. The apparent expectation of most panelists that growth in the next two decades will exceed the growth in the last decade (on a decade average basis) is clearly unreasonable, especially given the structural and political limits to growth evidenced over the last ten years.

Bedford, **Hooksett**, and **Salem** are the only notable exceptions to this pattern of growth, having all grown faster in the last half of the last twenty years, but I have allowed for this in my original forecast in the No-Build case.

I still also believe that the growth in the Build case, relative to the No-Build case will be moderate, for reasons I stated in my original write-up on my Build case. I am mindful that we are talking here about easing congestion in an already developed area (the I-93 corridor), not opening up a new wilderness to development. The pressures limiting growth will not change significantly just because the average commute time from **Manchester** to the Massachusetts border improves by twelve minutes. A moderate change in commuting time simply implies only a moderate increase in economic activity.

In summary I still believe my projections for the No-Build and Build cases are reasonable, and therefore I do not wish to revise them.

Panelist #2, Round 1 (no comment Round 2)

Population and Employment Forecast

I do not believe the population and employment forecasts for the build alternative in the secondary impact area, as you have defined it, will be substantially different than the numbers I provided you in the no-build alternative. Therefore for my forecasts you can use the same numbers that I provided in the no-build alternative.

I do believe the build alternative will help "extend" development further north into New Hampshire over the long term. I agree with the addition of Boscowen, Canterbury and Loudon to the secondary impact area and believe that all three communities could see significant increases in population similar to the numbers some panelists suggested for the no-build alternative. Likewise, for employment growth, particularly in Loudon because of access and the emerging industrial/commercial nature of Rt. 106.

The major beneficiary of the build alternative in my opinion would be the Lakes Region. This is because it is a very desirable place to live and is relatively less expensive than the more southern portions of the State, and improvements to I-93 will facilitate both commuting and tourism. Interestingly, this may also draw some business away from the North Conway area. Also the Plymouth, Franklin, Tilton area is well positioned for long term economic development which will eventually occur as the population base in this region increases. I think the OSP projections of 122,962 for this region might apply for the no-build alternative and the build alternative might add another 20,000 people.

The widening of I-93 will also have a long-term positive impact on both the North Country and the Upper Valley Lake Sunapee Region in the sense that it will help ease a highway "bottleneck" south of Manchester and make these areas more accessible. The primary impact will be on the tourism segments of the economy. Also given the recent plant closures in Berlin and Littleton, the OSP projections for North Country are probably optimistic.

I think some discussion is warranted in the EIS relative to both the commuter rail possibility and the economic uncertainties following the September 11th bombing of the World Trade Center. Both actions/events could change the way people commute to work and where businesses chose to locate, and at this time no one really knows the answer to this possibility. For example, severe oil shortages and gasoline price increases might reduce commuting. Also, following the tragedy in New York there is some evidence that businesses may want to disperse their operations more, which could make a New Hampshire location more attractive for business, and hence reduce commuting. Overall it seems like we are trying to forecast the future assuming an extension of the past, when this may not be valid. We should at least acknowledge some degree of uncertainty in this regard.

Panelist #3, Round 1

First, I was among the most bullish of the No-Build panelists. I believe the 21st Century technology and knowledge based global expansion will have strong roots in Boston (Harvard, MIT, etc.) as well as Rtes. 128/495. This is certainly the case for the first two decades. The growth pressures on southern and central New Hampshire will be real. However, I believe the growth bubble is already underway. Despite the slow down of the past 12-14 months, it will continue. It will continue with or without the widening of I-93. The 4-lane scenario does not increase my projections as much as it accelerates them. We were told by Ansel Sanborn and Jeff Brillheart that the construction phase will be 2008-2010, half way through the projection period.

I have not increased my projections of either population or job growth for the five Massachusetts towns. The construction is north of them and the growth pressure is from the south. I show slightly larger impacts toward **Manchester**. My premise is that continued growth in **Salem, Windham, Pelham** and **Derry** is inevitable. The quality of life, fresh air, green space and better schools will attract growth even with a LOS with all Fs on the lower portion of I-93.

Given New Hampshire's a well-educated homogenous work force with a higher level of entrepreneurs (tax free New Hampshire) job growth will continue.

The widening of Rte. 3 south of Nashua will ultimately bring growth on the west side of the Merrimack River to Nashua, Merrimack, Litchfield, **Bedford**, etc. The airport access road will open up 600-1,200 acres for business development. This will be the business epicenter for New Hampshire throughout the study period. The growth of the airport, especially post September 11th is nearly certain. This will be a huge economic catalyst for the region. The resulting congestion and sprawl from **Manchester** south will push development north toward **Concord** and beyond.

I am choosing not to pursue the growth impacts north of **Concord**. These will happen and can best be forecast once the I-93 corridor plan is in place. Once **Concord** becomes a 45-50 minute drive to Rte. 128, residential growth will be right behind.

I am presuming that generally the growth impacts will be closest to the clover leafs and diminished further away in rural communities with limited infrastructure.

Allenstown

Allenstown is far enough removed from I-93 to be only slightly impacted by the project. I am assuming no new river crossing at Exit 10 (**Hooksett**). **Hooksett** will explode during this period, which will result in some service sector jobs in Allenstown. (See recent article.)

Andover

Andover is south of the project area. I see little if any additional impact from increased capacity of I-93 to the north. Yes it will provide easier access for New Hampshire workers, but this should be minor compared to Massachusetts workers available on the other three points of the compass.

Atkinson

Atkinson is so far east it will have only minor impacts (above my base No-Build projections). The exception is a potential Exit 4A in **Derry**, if that works through to Rtes. 111 or 102, then Atkinson will experience a greater impact.

Auburn

Auburn, accessed from 101, will grow with or without the project. It will have moderate incremental impacts of 5%-7% from the increased I-93 capacity.

Bedford

Bedford will grow slightly more with the I-93 project, especially if the airport access road is brought across through **Londonderry** to Exit 5. But most of Bedford's growth will come with the airport, the access road and Rte. 3 corridor improvements in Massachusetts.

Bow

Bow, adjacent to I-93, will be impacted by the increased I-93 capacity (8%-12%).

Candia

Candia, like **Auburn**, five minutes east from Route 101, will be impacted slightly. Again, an Exit 4A connection through **Derry** might make much of **Chester** more accessible.

Concord

Concord, the seat of the state government will grow with or without the project. The ability for people to live in Concord and commute to Rte. 128 in under an hour will put residential growth pressure on Concord.

Danville

Danville is well to the east and will experience only slightly greater and perhaps faster growth from the project.

Deerfield

Deerfield is so remote to the project, little if any additional growth impact should be felt.

Derry

Derry will be impacted by the project with one or possibly two exits.

Dracut

Dracut (**Lawrence**, **Methuen**, **North Andover** and **Tewksbury**), like **Andover**, is south of the project. I project no *additional* growth impacts from the project.

Dunbarton

Dunbarton is well to the west of the I-93 corridor and will experience very little impact.

Goffstown

Goffstown, west of the Merrimack River and Rte. 3, will experience a minor additional growth from the project.

Hampstead

Hampstead is far enough east to experience only minor additional impacts.

Hooksett

Hooksett will boom from this project. Boston Sand and Gravel is looking to develop 3,000+ acres. Southern New Hampshire University has announced plans to sell some of their land to a Massachusetts developer creating 400± units.

Londonderry

Londonderry will be impacted. A 10% growth in population and less in jobs because jobs will come from the airport and the access road. Continuing the access road east to I-93 will open even more land.

Manchester

Manchester will be impacted. As the region's largest city, it will get its proportional share.

Pelham

Pelham will experience some additional impact but being on the border, its relative share will be less than **Derry** and **Hooksett** (it will grow with or without the project improvements).

Pembroke

Pembroke, contiguous to **Concord**, will feel additional impacts. Considerably more so if the I-89, Rte. 106 connection is built, opening up the PSNH parcel.

Raymond

Raymond will experience impact because while it is quite a distance east on Rte. 101, it is likely to be open to development (unlike **Auburn** and **Chester**).

Salem

Salem will feel additional impacts but again due to its proximity to the Massachusetts border, the relative impact will be less than between Exits 3 and 6.

Sandown

Sandown is remote enough to experience only minor additional growth.

Windham

Windham will be sought after, but buildable land will be scarce. Windham will grow with or without the project.

Essentially I see the most intense impacts between Exits 1 and 3 and closest to the corridor. The second tier of impacts will be up through Exit 5 and the 293 split and further out from the clover leafs. The third tier of impacts is further north and still further out from the clover leafs.

Panelist #3, Round 2

I have reviewed the latest panel projections and have trimmed my population projections for **Andover**, **Atkinson**, **Candia**, **Hooksett**, and **Pembroke**. I was pleased with the "tighter" grouping of projections among the panelists.   Per Rosemary Monahan's request to comment upon a three lane (i.e., three north and three south) scenario, I am unsure at this point what the impact would be.

Panelist #4, Round 1

During our public meeting earlier this month, several panel members stressed the importance of the assumptions we use when making our growth projections. The group seemed to agree that our final report should include not just our "numbers" but also a statement of our shared and divergent assumptions. Those assumptions would provide an essential context for anyone ultimately trying to develop policies to mitigate any of the negative impacts of the widening project.

I have listed the assumptions that I believe are most relevant to the secondary impacts study and would like the Parsons Brinckerhoff staff to present them to the panel along with comparable statements provided by other members for a "poll" of sorts. Using the same spreadsheet technology we've been using for the projections, let's determine the extent to which each of us agrees or disagrees on the basic assumptions. We might conclude the process with a second round of voting before or after the final meeting of the panel, though I don't think that will be necessary.

Assumptions
1. Four-lanes each direction from border to I-293 in Manchester
2. Four park & rides with 500 spaces each
3. No rail in median
4. Cleaner cars and buses, but still plenty of them
5. Increased bus service and ridership; increased carpooling
6. By 2015, four lanes each direction all the way to exit 15 (I-393, north of **Concord**). The northward widening is a secondary impact of the project before us; it will not happen if the southern leg is not widened.
7. New Hampshire will not adopt the kind of peak-hour tolls that other jurisdictions have used to spread out rush hours, reduce congestion, and encourage car-pooling.
8. Accelerating use of telecommunications/telecommuting (from home offices or small hubs in city and village centers) will result in fewer daily commutes per job, but more people living farther from their business' base.

9. Increasing scarcity of water and petroleum will be offset by gains in efficiency (low-flow showers, smaller lawns, fuel-cells, maybe even Dean Kamen's mysterious invention, "Ginger")

10. Greatly reduced reliance on the property tax for education and municipal services will moderate income stratification by town and remove some of the disincentives to denser housing/in-fill.

11. Wider highways, more pleasant and rapid commutes, will accelerate growth throughout the I-93 commute-shed. Traffic will expand to fill the space; by 2020, all lanes will again be at level-of-service F. (The Directional Design Hour Volume per lane—DDHV/L—will exceed 2,300, an increase in the number of vehicles compared to the no-build 2020 projections ranging from 27 percent at the border to 91 percent in **Manchester**.

12. Lack of adequate public investment/planning at the time of the widening will greatly aggravate congestion at many of the interchanges and feeder-road network from **Manchester** south. That congestion, coupled with the relatively free flow on the interstate itself will encourage growth from **Hooksett** to the north.

13. Obsolete or inadequate zoning regulations in many municipalities will prevent those municipalities from responding to the growth pressures induced by the project in ways that would strengthen the economy, environment, and quality of life in those towns.

14. It is unlikely that all of our assumptions will prove accurate over time. Unforeseeable events are likely to have a dramatic impact on the actual growth of the region. Better planning and broader public involvement in growth-management decisions will enhance the region's capacity to respond positively to those surprises.

Phase II Projections

I have kept my Phase 1 Round 2 projections as my starting point for Phase 1. I have also based the Phase 2 projections on the assumption that the more northerly and rural areas will grow faster (in percentage terms) than the towns adjacent to I-93 and the Massachusetts border. I have split the communities into three groups:

Group 1 (slowest growth) - **Andover, Bedford, Derry, Dracut, Goffstown, Lawrence, Londonderry, Manchester, Methuen, North Andover, Pelham, Pembroke, Raymond, Salem, Tewksbury, Windham**

Group 2 (faster growth) - **Allenstown, Atkinson, Candia, Concord, Hooksett**

Group 3 (faster growth) - **Auburn, Bow, Chester, Danville, Deerfield, Dunbarton, Hampstead, Sandown**

I have added Canterbury, Boscawen, and Loudon to Group 3, and developed a base projection for them using the same approach I used in Round 1 (multiplying their actual population growth from 1990 to 2000 by 2.25 and adding that product to the 2000 census figure).

I have added the Upper Valley Lake Sunapee RPC area to Group 3, the Lakes Region RPC to Group 2, and the NCC to Group 1. For each of these, I used the OSP population and employment projections as a base. Obviously, growth—including impacts related to I-93—will vary significantly among the towns in each of those regions, so the regional averages may not be very helpful. The I-93 project will have a much bigger impact on Hopkinton and Warner than on Dorchester and Newport.

For my Phase 2 population projections, I have increased my 2020 "base case" population and employment estimates by the following factors: Group 1 towns by 5 percent; Group 2 towns by 10 percent; and Group 3 towns by 15 percent. Because the Group 1 towns make up such a large share of the population and jobs in the region, the region-wide increase in population and jobs would be about 6 percent. I think it more likely that these estimates are too low than too high.

Panelist #4, Round 2

Once again, I have been impressed by the thoughtful essays and analysis presented by the panelists. Particular praise must go to Panelist 12 for his or her work with water resource data.

My first glance at the graph showing the panelists' projection totals for the area gave me the false impression that we had all pretty much agreed on our projections. All but two of the population bars are just above or below the 800,000 line. There seems to be an equally strong agreement about the likely number of jobs in the region in 2020. This apparent consensus breaks down, however, when one looks at the individual town projections. Our respective opinions about growth, it turns out, are literally all over the map. In several towns, the high and low projections differ by a factor of two.

I had always feared that the result of this process would be a claim that "experts predict highway project will bring X-thousand jobs to region," as if that were all that it would bring. I was surprised in scanning the documents in the last package that none of the tables or graphs neatly compared our build/no-build projections. So I pulled the bottom lines from each of our projections and stacked them up.

The two columns on the right show our respective estimates for the total change in population and employment that could be attributed to widening I-93. Our estimates of project-induced population growth range from zero to 133,100; our estimates of employment growth range from zero to 57,650.

Panelist	Your 2020 Allocation No-build, Population	Total 2020 Build Population	Your 2020 Allocation No-build, Employment	Total Build 2020 Employment	2020 Build Population Change	2020 Build Employment Change
1	714,900	725,890	379,100	387,180	10,990	8,080
2	753,000	753,000	442,600	442,600	0	0
3	863,100	892,000	441,400	457,620	28,900	16,220
4	751,320	799,844	446,640	474,252	48,524	27,612
5	707,350	765,650	349,635	389,635	58,300	40,000
6	762,000	808,500	368,100	394,850	46,500	26,750
7	752,450	799,650	390,200	411,200	47,200	21,000
8	745,000	784,500	397,900	414,200	39,500	16,300
9	745,000	775,100	419,900	437,530	30,100	17,630
11	748,000	762,850	392,260	403,160	14,850	10,900
12	701,900	835,000	397,900	397,900	133,100	

| **13** | 727,600 | 792,200 | 416,050 | 473,700 | 64,600 | 57,650 |

When graphed, that data looks like this:

Estimates of Impact of I-93 Project
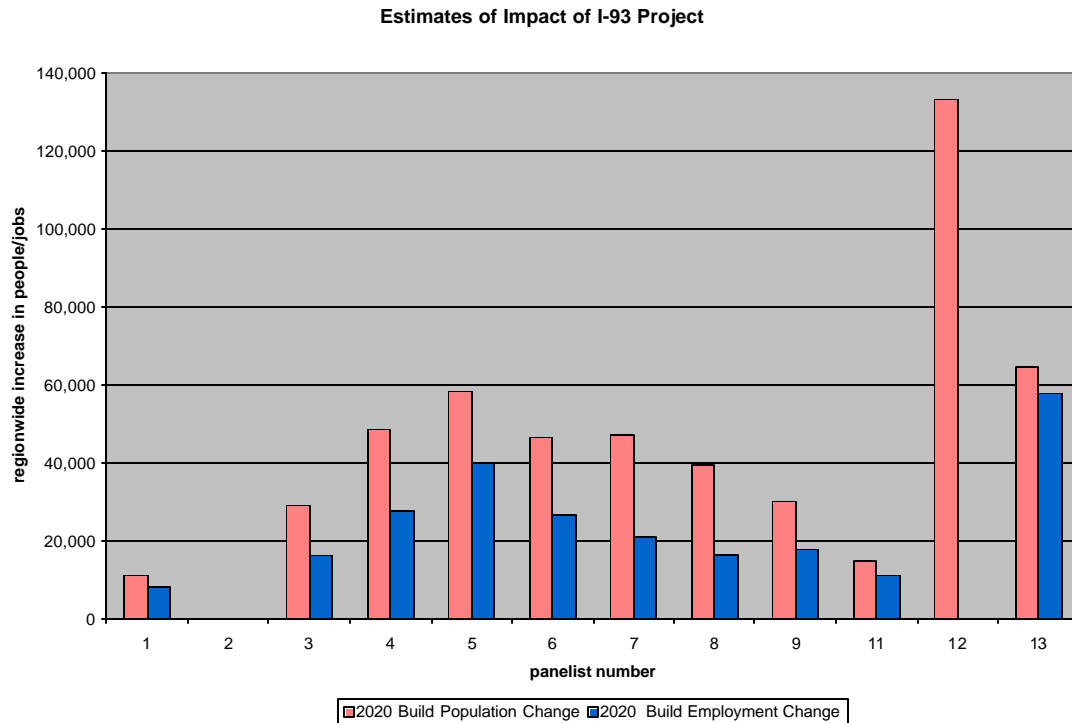
At this point in the analysis, it appears that we are operating under very different assumptions about how the project would affect the study area and I'm not sure how I would go about trying to characterize those assumptions.

I would strongly urge anyone trying to summarize the panel's views to stress the divergence of our opinions—at the local and regional level—rather than the apparent agreement that might be conveyed by focusing on our blending averages. Pairing the graph above with the graph at the top of the panel package (total for study area, 2020 build alternative) would go a long way to conveying our opinions about the project.

Of course, Round 2 might find us moving together, but as for my own projections, I'll leave them unchanged.

Panelist #5, Round 1 (no comment Round 2)

Estimates of Phase I <u>No-Build</u> alternative are in my estimation too high.

Build will result in significant increases in some communities. The majority growth impacts will be felt in the southeast portion of NH and northeast MA. With improvements underway on Rte. 3

the completion of Rte. 101 east from 93 to the beach and the existent Rte. 95 corridor, that section of the state will be experience unprecedented growth with the completion of the I-93 roadway.

North of **Concord**, NH communities will incur added growth pressures, not of the nature however, that they cannot be effectively managed.

Panelist #6, Round 1 (no comment Round 2)

In terms of methodology, I considered my estimates for Phase I, other panelist recommendations for Phase I, the mean, minimum/maximum for Phase I. I based my projections for population and employment growth on proximity to the Interstate and available infrastructure.

Allenstown

Limited grow out options. Doubt if "build" option will change current land use patterns substantially. State Park occupies substantial number of acres (parks and summer camp). Proximity to conservation (Park) lands will make available commercial/retail and residential areas more appealing (also appears to have sewer and water in commercial areas).

Andover

Area will continue to grow or decline with the high tech industry. Don't see this project having much of an impact on population. I-93 expansion will make Andover more accessible for NH skilled labor force will fuel more industry.

Atkinson

The combination of Route 111 and I-93 will fuel more population growth. Don't see much change in employment as a result of the expansion—a few more service sector jobs.

Auburn

Availability of land and access to both 101 and I-93 will fuel both population growth and employment growth.

Bedford

Expect growth to expand with the completion of the highway. Lots of available land and proximity to I-93 and I-293.

Bow

Lots of available land. I-93 expansion will fuel some additional population growth (commuters from **Manchester** and points south).

Candia

Has undeveloped land in desirable areas for commuters (and good access to mountains and coast). Employment will grow to support population growth.

Chester

Area will expand in population (spillover from **Derry**).

Concord

Population may increase slightly as a result of the road expansion (I adjusted my estimate upwards to reflect other panelists perspective).

Danville

Don't see much impact of the highway on population or employment estimates.

Deerfield

More likely to be impacted by Route 4 improvements than I-93 expansion.

Derry

Will see significant growth as a function of proximity to the expansion particularly in high-density housing (apartments and condos).

Dracut

Not really sure what impact highway expansion will have population. Could possibly experience some out migration depending on NH's tax climate.

Dunbarton

Proximity to the I-93 corridor and available land should allow some additional growth.

Goffstown

I-93 expansion will cause significant population growth.

Hampstead

Derry and **Salem** growth will expand into Hampstead with improved travel routes.

Hooksett

I-93 expansion will have a direct impact on population and employment. Most growth will be due to high-density residential development.

Lawrence

Not sure if I-93 will have any significant impact on Lawrence. Could make a case for population growth and loss.

Londonderry

Increase in population due to mix of high and medium density housing and increased job growth.

Manchester

I-93 will improve opportunities for professionals (two income families) with one commuting. Increased high-density housing.

Methuen

Not sure what effect if any I-93 will have population. Could have some employment impacts depending on NH and MA job growth rate.

North Andover

Not sure what effect I-93 will have on population. Seems like if improved, access could expand jobs. Increase in jobs could increase population.

Pelham

I concur with other panelists that the No-Build option would lead to higher population pressures.

Pembroke

Overflow from **Concord** and available land could fuel some growth in population and some job creation.

Raymond

I-93, Rte. 101, I-95 and I-495 loop, land availability and economic development plan could lead to considerable growth in both jobs and employment. Good access to coast and mountains and airports.

Salem

I don't see expanded I-93 have much of an impact on Salem.

Sandown

Don't see much impact from highway expansion.

Tewksbury

Don't see I-93 expansion having any population or job impacts.

Windham

Lack infrastructure to support much employment and jobs.

North Country and Lakes Region

I see I-93 having substantial impact on population growth and the associated employment growth. Growth will be fueled by continued appeal of natural resources.

Panelist #7, Round 1

Allenstown

With almost 70% of their land in conservation, and no industry to speak of, Allenstown will experience very limited growth in both population and employment. This scenario holds true, regardless of the I-93 build out. Of course, the highway expansion will bring additional pressure on the town and thus a slight increase in build out.

Andover

Due to its proximity to Boston and its existing base of high technology employers, Andover will continue to gain employment at a strong pace over the next 20 years. However, its population will begin to stabilize as land becomes scarce and developers move to more favorable locations, such as **North Andover**. These factors will limit the growth of Andover regardless of what happens with I-93. Andover will reach a maximum build out before 2020 in either case.

Atkinson

The reconstruction of Route 111 will have a significant impact as it makes Atkinson much more accessible to I-93 and hence, brings it within commuting distance to **Andover**, Burlington and Boston. Add to this the additional pressure of an I-93 expansion and you will see significant population growth in Atkinson. Employment will also increase, but at an incrementally smaller pace.

Auburn

Proximity to I-93 and Route 28 will continue to generate a strong growth rate in Auburn. Also a significant factor is the availability of large, undeveloped parcels of land. The added accessibility of an I-93 expansion makes this town an especially attractive candidate for developers. Growth in population will be significant.

Bedford

As **Manchester** continues to grow, so will Bedford. This applies to both population and employment. Large tracts of land still exist for residential, commercial and industrial development. Most of this development will take place with or without an I-93 expansion.

Bow

An I-93 expansion will place significant pressure on Bow to grow, primarily in population. In it's role as a bedroom community, employment will increase at a much lower rate.

Candia

An I-93 expansion will place Candia within commuting distance of several major commercial centers. Thus, it will have a substantial impact on its population growth.

Chester

Like **Candia**, Chester will experience significant population growth as a result of the I-93 expansion. It will now be within commuting distance to Andover, etc. for many more workers.

Concord

I see the I-93 expansion having a much less impact on the population growth of Concord vs. the surrounding communities. It is unlikely to draw much of the "bedroom community" growth that other local, smaller communities will experience.

Danville/Deerfield

Though they will be affected, they each are too far east to be significantly impacted by this proposed expansion.

Derry

The increased accessibility provided by the I-93 expansion will bring continued growth to Derry at a high rate of growth from now until they reach 100% build out.

Dracut

Existing densities, taxes and proximity to New Hampshire will all play a role in limiting Dracut's growth in both areas throughout the next two decades. This will take hold regardless of the I-93 expansion.

Dumbarton

As a percentage, I-93 could significantly influence the growth rate in this small community.

Goffstown

The population growth of **Manchester** will continue to push west in to Goffstown, resulting in significant growth rates for this municipality. Most of this will take place with or without I-93. Thus, the expansion of I-93 will result in a limited increase in growth.

Hampstead

Similar to **Atkinson**, this community will feel the effects of a rebuilt Route 111 in the very near future. The additional pressure of an I-93 expansion will result in significant growth in its population. This is mostly due to the enhanced accessibility of Hampstead to major commercial centers like Burlington and **Andover**.

Hooksett

Similar to **Goffstown**, **Manchester** will continue to push northeast into the Hooksett area. This will result in moderate growth in both employment and population. The decrease in commuting time between Hooksett and northern Mass will result in significant growth for Hooksett.

Lawrence

The growth rate of Lawrence will be mostly unaffected by the expansion of I-93.

Londonderry

Large tracts of developable land, both residential and commercial when combined with its proximity to **Manchester**, **Derry** and I-93 mark Londonderry for significant growth throughout 2020. Expanding I-93 will significantly grow the population of Londonderry while the growth **Manchester** experiences from the expansion of I-93 will significantly grow the employment base of Londonderry.

Manchester

Expanding I-93 will greatly influence the growth rate of Manchester in population and employment. The increased accessibility to areas south will result in many more business determining the Manchester area to be a viable location for them to do business from.

Methuen

Methuen's growth rate will be relatively unaffected by the I-93 expansion.

North Andover

North Andover's growth rate will be relatively unaffected by the expansion of I-93.

Pelham

Pelham's close proximity to MA will mandate a significant growth rate regardless of what happens with I-93. The expansion will have a limited impact on this rate of growth.

Pembroke

An I-93 expansion brings Pembroke to within reach of many additional commuters. Look for the growth rate to increase significantly if the expansion takes place.

Raymond

An I-93 expansion will have a significant impact on Raymond as a percentage, small as a whole number.

Salem

Salem will reach maximum build out with or without the I-93 expansion.

Sandown

Too far from I-93 and/or Route 111 to experience any significant growth in either area.

Tewksbury

Tewksbury will grow at a significant rate with or without the expansion of I-93. It's proximity to Burlington and **Andover** will cause it to grow to maximum capacity regardless

Windham

Barring the introduction of a public water or sewer system, Windham will achieve 98% of it's maximum build out by the year 2020. This is regardless of the reconstruction of Route 111 or I-93. This same factor will limit commercial/industrial development to a slow pace.

Panelist #7, Round 2

Based on the comments from some of the other panelists, and reviewing their own projections, I moved a couple of the towns up slightly and one or two down slightly.

Panelist #8, Round 1 (no comment Round 2)

Growth and employment are determined by many factors, however, the major factors are zoning and utilities (sewer/water/gas/etc.) With less time to get home from work, the more attractive a community will be. Schools are important to growing families but private schools are growing and readily available in the Southern tier of New Hampshire. Most of the cities have all of these assets and, therefore, will grow faster in both population and employment. The towns will grow because they will be easier and faster to reach with the widening of the highway and people desiring a yard for their children to play in.

The Massachusetts cities of **Dracut, Methuen, Lawrence, Andover, North Andover**, and **Tewksbury** should grow substantially as the migration out of Boston develops with the widening of I-93. This will occur both as to housing as well as jobs.

The New Hampshire towns of **Danville, Sandown, Raymond, Deerfield** and **Dunbarton** will grow at a much reduced rate both as to population and employment because of their zoning laws as well as the secondary roads leading from I-93 to the towns.

Bow, Pembroke, Goffstown, Candia, and **Auburn** will have substantial population growth because of their being the bedroom communities to the larger cities they surround.

Salem, Derry, Londonderry, Manchester, Bedford and **Concord** will have substantial growth in both population and employment because of the available utilities and zoning. With the ease of transportation they should be targets for growth.

Panelist #9, Round 1 (no comment Round 2)

Consistent with my phase I response, I think the majority of the population and employment growth will occur in Town's abutting I-93.

Population & Employment

In phase I, under a No-Build scenario, I thought that OSP did a fairly good job in predicting population and employment growth within the target area.

In phase II, I estimate that there will be marginal increases in population over and above that predicted by OSP for communities like **Andover, Bow, Concord, Goffstown, Hampstead, Hooksett, Lawrence, Methuen** and **Tewksbury**. Towns such as **Bedford, Derry, Londonderry, Manchester, Windham** and **Salem** will experience *faster* than average growth rates. I attribute these increases in population to increases in employment which will occur above that predicted by OSP.

My population increases are largely tied to employment growth. As the area becomes more attractive to employers because of various factors such as: time and ease of travel, availability of land, available infrastructure capacity, good quality of life and an educated labor force both in northern Mass and southern NH. These factors will cause increased pressure for the target area municipalities to provide affordable housing. Given the high median income and median housing prices within the target area, the need and amount of affordable housing to accommodate the increases in employment will drive the increases in population in the above listed Towns. As shown on Map 11 in our information booklet, **Manchester, Londonderry, Derry, Salem**and **Windham**, all of which directly abut I-93, are trip destination areas. The predicted growth in employment within the target area will only increase the number of trips that are destined for the aforementioned communities.

The widening of I-93 will serve to improve the mobility, access and growth of southern NH. As mentioned earlier, I predict marginal growth above that predicted by OSP. I think the widening of I-93 will serve to *speed up* the rate of growth within the target area rather than add to the *amount* of growth.

The remaining communities, given their proximity to I-93 and the limited amount of available land and infrastructure, in my estimation, will continue to grow as predicted by OSP.

Panelist #10, Round 1 (no comment Round 2)

This memo builds on my 31 August memo in response to Round 1. I have categorized the 23 NH towns of the 29 in the study area using a methodology developed by NH Minimum Impact Development Partnership, based on number of housing units, presence or absence of municipal water, and nature of significant land use (see www.thejordaninstitute.org):

CATEGORY	MUNICIPALITIES	# OF MUNIS	TOTAL IN NH	% OF NH TOTAL
Wild	**0**	**0**	**9**	**0%**
Working	**0**	**0**	**13**	**0%**
Rural	**Auburn** **Candia**	**6**	**106**	**6%**

	Chester Danville Deerfield Dunbarton			
Village	**Sandown**	**1**	**56**	**2%**
Small Town	**Hampstead Pembroke Raymond**	**3**	**31**	**10%**
Large Town	**Goffstown Hooksett**	**2**	**17**	**12%**
Recreational	**0**	**0**	**5**	**0%**
Suburb	**Allenstown Atkinson Bedford Bow Londonderry Pelham Windham**	**7**	**14**	**50%**
Small City	**Concord Derry Salem**	**3**	**6**	**50%**
Large City	**Manchester**	**1**	**2**	**50%**
NA	**Andover, Dracut, Lawrence, Methuen, North Andover, Tewksbury, MA**	**6**	**NA**	**NA**
Totals	23 in NH	29	259	NA

Please note that the ten municipal categories describe a continuum of density—from wild and working with no permanent residences to the rural, village, and small towns (75% of New Hampshire's 259 municipalities and unincorporated places) to large towns, recreational and suburban towns, and the six small and two large cities. The categories are not intended to convey any subjective evaluation of municipality character, but rather an objective classification.

This analysis reveals that half of New Hampshire's large and small cities and suburbs are in the study area. Significantly, because of increased physical capacity to absorb growth, and decreased planning infrastructure, the three small towns, one village, and six rural communities will most likely grow proportionately more than the suburban and existing urban areas. I estimate perhaps a 10-15% increase in growth, with widening. Currently, there is a perceived demand for single family housing in low density, single use areas of towns considered to be "rural." Trends suggest that unless other influences take root, that perceived demand will continue to generate such construction in southern NH, at the exclusion of other options. The two large towns of **Goffstown** and **Hooksett** are farther along in the development process, so the proportionate increase associated with widening may be less significant (in the 5 % range).

I provide these estimates with great reservation, because as I stated in my Round 1 response, I believe that growth in southern NH is multi-variate and interdependent, and will diverge more from current trends than the growth patterns of the past 20 years, most likely increasing at a faster rate than previously.

I urge that all the effort and expertise expended on this Delphi process be translated into effective support for municipalities. My key concerns remain—how will any increased population and

employment be distributed within the affected municipalities? And what assistance can be made available to help those municipalities intentionally shape their own growth patterns, to retain the diversity of density and quality of life that drives New Hampshire's economic engine??

Panelist #11, Round 1 (no comment Round 2)

Below is a summary of the reasoning relative to the allocation of employment and population projections for 2020 for an I-93 build scenario. This memorandum has been organized by municipality as requested.

Allenstown

The expansion of I-93 should not affect employment growth and have a slight impact on population growth in Allenstown due to its lack of direct access to the interstate.

Andover

I do not believe that any of the Massachusetts communities included in the I-93 study area will experience dramatic increases in employment due to the expansion of the interstate in New Hampshire. I expect that Andover's employment base will grow by 400 due to the project. I expect increases in population due to the project to also be slight in relation to overall totals - with an expected increase of 500 persons in the build scenario.

Atkinson

While Atkinson is in the southern tier of the state which will be most affected by the widening of I-93, it is still one community removed from the interstate. For that reason, I do not expect a large increase in employment due to the project. The community will likely experience a more noticeable increase in population due to the easier commute to the south.

Auburn

The town of Auburn does not have direct access to I-93, but the access afforded by the connection of NH 101 to I-93 should result in a relatively strong increase in both employment and population in a build scenario. I expect employment will grow by 250 due to the improvements, with population increasing a corresponding 500 persons.

Bedford

I believe that Bedford will experience moderate increases in employment or population in the build scenario. While the community does not have direct access to I-93, its proximity to I-293 will promote both population and employment growth.

Bow

The town of Bow will likely experience some population growth related to the improvements along I-93 due as comfortable commutes are extended. Employment related to the interstate services that have located in Bow in the past will likely also increase.

Candia

With access to NH 101, Candia will likely see some affect of the I-93 improvements, albeit not too dramatic. I foresee an increase of 200 persons and employment growth from 400 to 500 in the build scenario.

Chester

With its location one community removed from I-93, the impact of the I-93 widening should be somewhat muted in Chester. I project an increase of 300 persons and 50 jobs in the build scenario.

Concord

Although Concord is at the northern end of the study area, its numerous interchanges and available commercial and industrial areas should result in relatively strong growth in both population and employment despite its proximity to the actual improvements.

Danville

Danville's location that does not afford easy access to I-93 should keep population and employment increases related to the project to a minimum. I project no employment growth due to the build scenario.

Deerfield

Deerfield's location that does not afford easy access to I-93 should keep population and employment increases related to the project to a minimum. I project no employment growth due to the build scenario.

Derry

I believe that Derry will see strong growth due to the improvement of I-93. Both employment and population should see increases with housing provided for new residents working in Derry as well as to the north and south along I-93.

Dracut

I do not believe that any of the Massachusetts communities included in the I-93 study area will experience dramatic increases in employment or population due to the expansion of the interstate in New Hampshire. I expect that Dracut's employment and population base will grow even less that other Massachusetts communities due to its lack of a direct access to I-93.

Dunbarton

I expect that there will be no additional growth in Dunbarton in the build scenario due to the town's location in the northern tier of the study area and the lack of direct interstate access.

Goffstown

Goffstown is another community that should see some moderate increases in both employment and population in the build scenario. The increases will be tempered by the lack of direct access to the interstate.

Hampstead

Hampstead's location that does not afford easy access to I-93 should keep population and employment increases related to the project to a minimum. I project an increase in employment attributable to the I-93 improvements of 100 persons.

Hooksett

Hooksett's proximity to the I-93 corridor, as well as its availability as a lower cost alternative for housing will continue to promote population growth. In addition, additional service and professional jobs due to the build scenario should number 600.

Lawrence

I do not believe that any of the Massachusetts communities included in the I-93 study area will experience dramatic increases in employment or population due to the expansion of the interstate in New Hampshire.

Londonderry

As expected in **Derry**, I believe that Londonderry will see strong growth due to the improvement of I-93. Both employment and population should see increases with housing provided for new residents working in Londonderry as well as to the north and south along I-93.

Manchester

I expect Manchester to be another community that experiences a substantial increase in employment and population due to the build scenario, although not the relative increases as expected in **Derry** and **Londonderry**. I expect employment to grow by 1,000 and population to increase by 1,250.

Methuen

I do not believe that any of the Massachusetts communitie s included in the I-93 study area will experience dramatic increases in employment or population due to the expansion of the interstate in New Hampshire.

North Andover

I do not believe that any of the Massachusetts communities included in the I-93 study area will experience dramatic increases in employment or population due to the expansion of the interstate in New Hampshire.

Pelham

An increase to four lanes in each direction in the southern section of the I-93 project should result in a strong increase in population in Pelham, even in light to the distance between the town boundary and the interstate. That distance should temper any large gains in employment due to the build scenario.

Pembroke

Pembroke's location that does not afford easy access to I-93 should keep population and employment increases related to the project to a minimum. I project no employment growth due to the build scenario.

Raymond

Similar to **Auburn's** situation, the town of Raymond does not have direct access to I-93, but the access afforded by the connection of NH 101 to I-93 should result in a relatively strong increase in both employment and population in a build scenario. I expect employment will grow by 200 due to the improvements, with population increasing a corresponding 250 persons.

Salem

As expected in **Pelham**, an increase to four lanes in each direction in the southern section of the I-93 project should result in a strong increase in population in Salem. The improved access should also serve to drive increases in employment.

Sandown

Sandown's location that does not afford easy access to I-93 should keep population and employment increases related to the project to a minimum. I project no employment growth due to the build scenario.

Tewksbury

I do not believe that any of the Massachusetts communities included in the I-93 study area will experience dramatic increases in employment due to the expansion of the interstate in New Hampshire.

Windham

I expect Windham to see substantial population growth in relation to its existing level because of the I-93 expansion. In addition, I expect employment to increase from 1,600 in the no-build to 2,200 in the build scenario.

Boscawen, Canterbury and Loudon

While not to the levels to be expected in the communities along I-93 to the south, I expect the towns of Boscawen, Canterbury and Loudon to see some growth in the build scenario because of the direct access to each community from the interstate. Population growth should be moderate in each community, with the major expected employment growth occurring in Canterbury as industrially zoned lands become more viable.

Panelist #12, Round 1 (no comment Round 2)

My comments are limited to estimating population growth only, and only to those towns in New Hampshire where additional data are available to me for use in GIS analyses. In order to refine estimates of population growth, the adequacy of future water supplies has been selected as a key limiting factor in determining where growth will occur and in what manner. Part One of my comments below provide an overview of my analysis and conclusions regarding general growth trends in the region. Part Two of my comments focuses on my rationale for and estimates of population growth with the I-93 Build Alternative.

Part One: Review of Municipal Water Supplies in I-93 Corridor Study Area

An analysis of existing and future potential for municipal water supplies was made, as follows, using recent GIS datasets available from the NHDES Water Resources Division:

First, all public water supplies were queried to identify only those providing water to municipalities and/or private, resident developments (322 in total for the 23 towns in New Hampshire). The associated source water protection areas were also displayed since they tend to emphasize relative importance in terms of number of persons served due to varying sizes, and therefore demand in gallons/day. These water supplies were further stratified into bedrock wells, gravel pack wells in stratified drift aquifers, and other water sources such as the surface water intake at Lake Massabesic serving the city of **Manchester**.

As can be seen in the accompanying map, *a geographically-tight grouping of bedrock wells is found in the southern and most built-up communities in the study area* (232 of 322 wells), including **Londonderry, Derry, Hampstead, Windham, Pelham, Salem**, and **Atkinson**. The few gravel pack wells in the dataset are scattered around the study area and are associated with

the Soucook aquifer in the **Concord/Pembroke** area, minor aquifers along watercourses in **Raymond, Goffstown** and **Pelham**, with a few outliers in **Hooksett** and **Derry**.
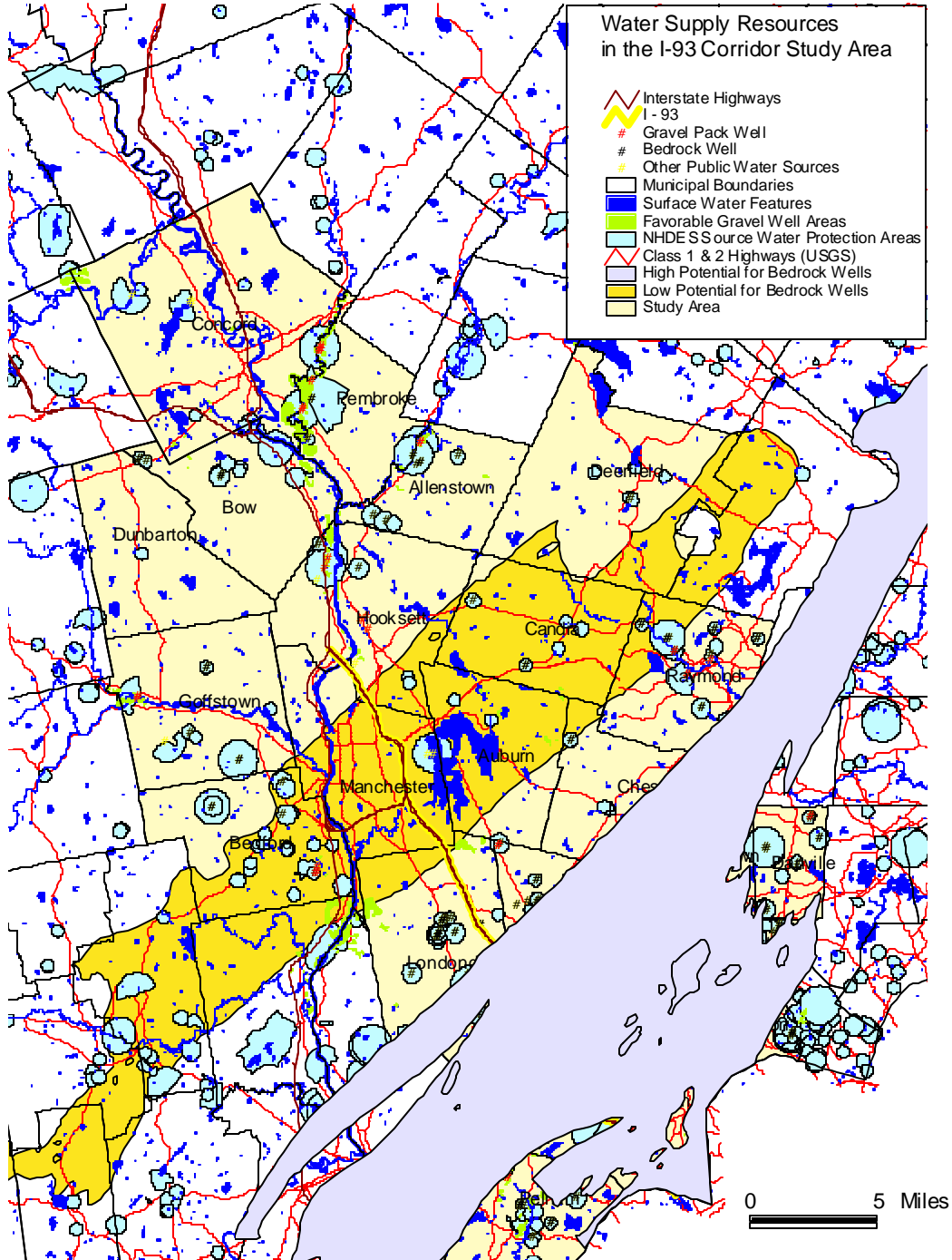
Second, a *favorable gravel well analysis* was made for the study area, using a methodology and datasets developed by the NHDES to aid communities in New Hampshire in identifying currently undeveloped and potential municipal water supplies in stratified drift aquifers. This approach removes various land uses detrimental to water supplies, such as roads, contamination sites, etc., as well as land already devoted to recharge of wellheads, leaving only those areas deemed capable of supplying a minimum of 150gpm, most typically in a gravel pack well. The accompanying map *shows very limited areas remain to be developed in the aquifers in or near the study area* (see the green polygons along the Soucook River in **Concord** and **Pembroke** and similar areas near **Bedford** and **Londonderry**).

Third, a review was made of an unpublished study recently completed by USGS *to identify the potential for bedrock aquifer water supplies in NH*. The goal of the review was to estimate the general probability of developing future municipal-scale water supplies from bedrock aquifer sources in lieu of available stratified drift aquifer sources in the study area. While only an approximation can be made at this time, the probability of developing water supplies is depicted in the accompanying map based on certain bedrock formations found across the study area. As can be seen, a strong correlation appears to exist between the dense cluster of existing bedrock wells in the southern part of the study area and a formation with *high probablity* for significant water yield from a bedrock well. "High probablity" translates into approximately a 1 in 5 chance of developing a 40 gpm well suitable for public water supply. A region of relatively *low probability* (1 in15 chance) exists across **Bedford** and **Manchester**, trending northeast into **Auburn, Candia** and part of **Deerfield**. Other areas can be grouped into a moderate probability class (1 in 10 chance).

It should be noted that this interpretation generalizes the data represented in the study, and that future, more detailed studies by USGS may reveal localized opportunities for municipal development of public water supplies not indicated in the statewide analysis and mapping. However, the current overview tends to indicate rather limited potential for creating new water supplies in the bedrock aquifers in the study area.

Furthermore, the USGS study also stresses that the *sustainability of the bedrock aquifer water supply resource is not well understood*. Initial well yields typically drop after a period of time, and ability of the natural system of recharge in bedrock fractures to meet the existing and future co-mingled drawdown of numerous bedrock wells is unknown.

Discussion

These dynamics –

- extremely limited availability of well sites in high-yield (150 gpm) stratified drift aquifers,
- low to moderate potential for bedrock wells with relatively low to moderate yield (40 gpm), and
- questions regarding the sustainability of increasing demand placed on the groundwater resource

-- all point to water supply as a significant limiting factor in supporting and influencing the geography of residential, commercial and industrial growth in the study area and in fact in the larger region.

Absent a regional plan for large-scale water supply to communities with a rapidly expanding population and employment base, it seems reasonable to assume for the most part that development will follow readily available (read: *economically attractive*) water supplies, among

other necessary resources. This trend will likely translate into a first-come, first-served incrementalized development pattern that is the seedbed of classic urban and suburban sprawl.

Residential development is not likely to increase in density -- especially with multi-family in-fill as posited in several of the panelists *No-Build Scenario* population extrapolations – without abundant existing and potential water supplies to exploit. Business development requiring significant volumes of processing water will also be similarly limited. Relatedly, the build-out and escalating water supply demands of high technology along I-495 in Massachusetts has caused many communities there to exceed or be very near the limit of water withdrawls mandated by the state. This is well documented in the Metropolitian Area Planning Council's *I-495 Technology Corridor Initiative* and community build-out scenarios which focus on water supplies as a key issue area.

Two surface water sources are apparent in the region: the city of **Manchester's** reservoir at Lake Massabesic, and the Merrimack River. NHDES water use data indicate 44% remaining capacity until the maximum daily drawdown is reached, so the city has significant capacity to meet its growth needs (the accuracy of this calculation has not been verified by the writer). It currently also supplies water to several adjacent communities, and may be able to function as a residential and industrial water supplier to these towns as they grow. This tends to indicate that **Manchester's** existing water supplies may serve to attract growth in and around the city.

The Merrimack River may also serve as a regional water supply in the future, but the certainty of this is less clear than the water resources available in Lake Massabesic due to stringent *Large Groundwater Withdrawl Rules* adopted in NH in 2001. These regulations ensure that the ecology of water resources and the needs of present water users are not adversely affected by new, large groundwater withdrawls. Moreover, new instream flow rules are being drawn up that will further regulate water users and protect instream flow volumes. Therefore, the regulatory climate in New Hampshire and due diligence with regard to impacts on communities in nearby Massachusetts strongly suggest that development of new water supplies from the Merrimack River are limited and unlikely.

Summary Regarding Water Supply as a Limiting Factor in Study Area Growth
The potential for developing new high-yield water supplies in stratified drift aquifers is extremely limited, based on a favorable gravel well analysis.

2. Only moderate to low potential exists for developing new bedrock water supplies across the study area. Potential is especially low in a large central portion of the study area, and may be severely limited by intensive development of existing bedrock wells in the southern quarter of the study area.

Some potential exists to maximize use of already developed water supplies in the city of **Manchester** reservoir at Lake Massabesic, but the tendency will be to focus growth close to the city for practical reasons of water supply distribution system design.

Development of the Merrimack River for new water supplies is questionable due to increasing regulation of such resources.

No long-term regional plan exists for providing water to meet growth demands. This will foster scattered, piecemeal, low-density growth over much of the area during the study time period 2000 to 2020, exacerbating sprawl and impacting the fiscal well-being of communities unequally.

Over time, it is likely that growth will be forced outside the study area due to limited water supplies and more attractive and economic development and residential opportunities in more rural, unspoiled towns.

Part Two: Rationale for Assigning Population Growth in the "Build" Scenario

My estimates of population growth in the "Build" Scenario are based on a series of assumptions made in evaluating the "No-Build" Scenario (see comments of Panelist 9 in earlier reports), with following changes and additions:

I reviewed the original forecasts of Slow, Moderate, and Strong Growth in light of new information on existing and potential water supplies to support growth. Changes were made in 9 of 23 NH communities; eight communities were forecast with increased growth and one was downshifted due to apparent scarcity of water resources in that town (**Candia**). These changes can be seen in the accompanying table.

Based on changes made in general growth forecasts, the estimated population change was re-calculated per the original No-Build approach (Slow = NHOSP 2020 projected population, Moderate = NHOSP 2020 figures plus 10%, and Strong = NHOSP 2020 figures plus 20%). This yielded an updated "No-Build" Projected Population Change.

In two cases, the updated population gain was increased to offset what appears to be a low projection by NHOSP. **Hooksett** was increased due to probable water supply resources being extended from **Manchester**, and **Dunbarton** was increased to account for the likelihood of low density residential development spilling over from the I93 corridor proper.

Finally, all adjusted population projections were uniformly factored up by 10% to account for the intrinsic growth inducing effect of the improved Level of Service over much of the I-93 improvement corridor.

Municipality	1990 Census Population	2000 Census Population	2000 OSP Population Projection	% Population Change 1990 - 2000	% Population Actual 2000 v. OSP 2000 Projection	Round One "No Build" Growth Rating	Round Two "Build" Growth Rating	Projected "No Build" Population Change	OSP 2020 Population Projections	Updated "No Build" Population Change	"Build" Population Projection Factored Up for LOS
Allenstown	4,649	4,843	4,991	7.4%	-3.0%	Slow	Slow	1,000	5,900	1,000	1100
Atkinson	5,188	6,178	6,341	22.2%	-3.0%	Slow	Slow	2,500	8,673	2,500	2750
Auburn	4,085	4,682	4,889	19.7%	-4.0%	Mod	Strong	2,800	7,194	4,000	4400
Bedford	12,563	18,274	15,129	20.4%	21.0%	Slow	Slow	2,500	20,820	2,500	2750
Bow	5,500	7,138	6,280	14.2%	14.0%	Mod	Strong	400	7,501	2,000	2200
Candia	3,557	3,911	4,052	13.9%	-3.0%	Strong	Mod	1,700	5,320	2,000	2200
Chester	2,691	3,792	3,409	26.7%	11.0%	Strong	Strong	1,200	4,805	1,200	1320
Concord	36,006	40,687	39,095	8.6%	4.0%	Mod	Strong	6,300	46,382	15,000	16500
Danville	2,534	4,023	3,538	39.6%	14.0%	Mod	Mod	1,700	5,580	1,700	1870
Deerfield	3,124	3,678	3,646	16.7%	1.0%	Strong	Strong	2,400	5,623	2,400	2640
Derry	29,603	34,021	34,576	16.8%	-2.0%	Slow	Slow	11,300	45,299	11,300	12430
Dunbarton	1,759	2,226	2,005	14.0%	11.0%	Strong	Strong	300	2,476	1,000	1100
Goffstown	14,621	16,929	16,227	11.0%	4.0%	Mod	Strong	4,500	21,054	8,400	9240
Hampstead	6,732	8,297	8,301	23.3%	0.0%	Slow	Slow	5,200	13,442	5,200	5720
Hooksett	8,767	11,721	9,937	13.3%	18.0%	Mod	Mod	600	12,219	1,500	1650
Londonderry	19,781	23,236	23,405	18.3%	-1.0%	Slow	Mod	11,500	34,717	15,000	16500
Manchester	99,567	107,006	105,951	6.4%	1.0%	Slow	Slow	9,000	116,020	9,000	9900
Pelham	9,408	10,914	11,506	22.3%	-5.0%	Slow	Mod	6,400	17,285	8,100	8910
Pembroke	6,561	6,897	6,903	5.2%	0.0%	Mod	Mod	1,400	8,187	1,400	1540
Raymond	8,713	9,674	10,439	19.8%	-7.0%	Mod	Mod	4,500	15,059	4,500	4950
Salem	25,746	28,112	29,724	15.5%	-5.0%	Slow	Slow	12,000	40,159	12,000	13200
Sandown	4,060	5,141	5,211	28.3%	-1.0%	Mod	Mod	3,700	8,528	3,700	4070
Windham	9,000	10,709	10,598	17.8%	1.0%	Slow	Mod	4,000	14,736	5,500	6050
Totals	**324,215**	**372,089**	**366,153**	**12.9%**				**96,900**	**466,979**	**120,900**	**132990**

Panelist #13, Round 1 (no comment Round 2)

Allenstown

I would expect that it would grow more rapidly as a suburb than an employment center. However, it could be a home of small "geographically free" businesses.

Andover

I don't think there will be much population change in Andover due to the fact it is affluent and close to build out. There will be pressures to increase industrial densities with consequent job development.

Atkinson

I would predict this town would be more impacted by I-495 than I-93. Given its high median income and lack of major road infrastructure, I predict greater population than employment growth.

Auburn

A tough call to predict! It has a large landmass yet the zoning calls for minimum industrial/commercial growth. I think the highway expansion will have a large residential impact, but little impact on commercial/industrial employment.

Bedford

This town will be subject to great changes due to the Route 3 improvements in Massachusetts, its I-93 frontage and its location. These changes will be in population and job growth.

Bow

This town looks like a candidate for extensive industrial and population growth. The highway will draw it closer to job centers.

Candia

With its suburban character and limited industrial/commercial land base, I predict this town will become increasingly suburbanized. There will still be minimal job growth.

Chester

I see no change in terms of industrial/commercial growth. However, it appears there is good access along a state road to I-93. This would influence residential growth at a faster rate.

Concord

I think Concord will grow more rapidly as a result of the highway expansion. It has a high quality of life, room to expand, good infrastructure and is at the junction of two interstates.

Danville

I see no influence of the highway expansion on this town.

Deerfield

I see no influence of the highway expansion on this town.

Derry

I think this community is likely to be a major recipient of growth due to its location, size and infrastructure.

Dracut

Dracut is close to build out. Moreover, it is an old mill town (I think), I predict no meaningful population growth and moderate employment growth. It will be more influenced by Rte. 3 than I-93.

Dunbarton

Given character and location of this small rural town, I see little change.

Goffstown

Given its largely rural and removed character, I see little employment growth. However, I do expect some residential growth as a result of the expansion.

Hampstead

I see some population growth due to local highway improvements, but little economic development change.

Hooksett

I predict significant growth due to both Rte. 3 and I-93. It could be a new center attracting growth from both **Concord** and **Manchester**.

Lawrence

I predict little population growth because it is at build out. The growth that does occur will be due to the larger families common to immigrants. In terms of employment, I predict it will grow significantly: Its mills are still underutilized.

Londonderry

I predict this town will boom. Given its size, location and highway access significant acreage available for industry, it is well positioned to welcome economic development.

Manchester

I predict only minimal population growth, but significant employment growth as its industrial base expands.

Methuen

This city is close to build out. There will be some employment growth as its industrial facilities and parks fill.

North Andover

Given its strict zoning and high quality of life, I predict minimal population growth. There will be some employment growth due to infill.

Pelham

Pelham will have substantial residential growth due to the expansion of both Rte. 3 and I-93. I see minimal employment growth.

Pembroke

As **Concord** grows so will Pembroke. It will grow residentially and as a result of the confluence of several highways, will also attract industrial/commercial development.

Raymond

I see little change from the No-build option.

Salem

This town is well positioned for significant population and employment growth. I predict that job growth will be more significant than population expansion.

Sandown

I see minimal growth for this town. The No-build option appears to be accurate.

Tewksbury

Growth will occur here with or without the I-93 expansion. It could be a boom town.

Windham

While well situated along I-93, I predict slow population growth due to strict zoning. On the other hand, it will be the recipient of significant industrial/office park development.

Panelist #14, Round 2 (no comment Round 1)

The Phase II growth allocations for the Build case are easier to make than the Phase I allocations for the No-Build case. The Phase I allocations are predicated on a complex set of environmental, economic, geo-physical and social circumstances, particular to the region and to each community in the study area. For the purposes of the Phase II allocations, we assume that the Phase I allocations are correct. The important inference in the Phase II allocation is what the marginal impact will be from construction of the proposed improvements to I-93.

Assumptions:

1.) Construction will be 4-lanes in each direction between **Salem** and **Manchester**. We have been provided with 2020 Level Of Service (LOS) projections for the 4-lane option.

2.) All other conditions the same as for the Phase I allocations.

3.) Easy highway access is a strong factor in commercial development and job growth.

4.) Easy highway access is a moderate factor in residential development and population growth.

5.) Communities that are expected reach their natural build-out condition prior to 2020, in the No-Build case, may see the date of their build-out condition advanced, in the Build case. This would not be reflected in the Phase II allocations in the year 2020, however (build-out is build-out).

What is likely to remain the same in the Build case?

The introduction of the proposed improvements to I-93 will not have any measurable impact on natural population growth, from new births to local households. There may be a minor increase in in-migration to the study area, based on a lessening of a negative perception. People are more likely to be motivated in their housing choices by a strong perception of transportation problems, such as frequent and substantial delays, than they are by a positive perception, such as a short and convenient commute to work.

What is likely to change in the Build case?

Employers are likely to strongly consider local and regional transportation infrastructure in their plant-site choices. For this reason, job creation and employment growth is likely to be stimulated by the proposed improvements to I-93.

What is the geographic scope of the changes?

The impact of the proposed improvements to I-93 will be greater next to the corridor and lessen towards the edges of the study area. The rate at which the impact falls off is likely to be greater for employment than for population. The reasoning here is that employers see the advantages of a good local transportation infrastructure, in making plant siting choices, diminish more rapidly

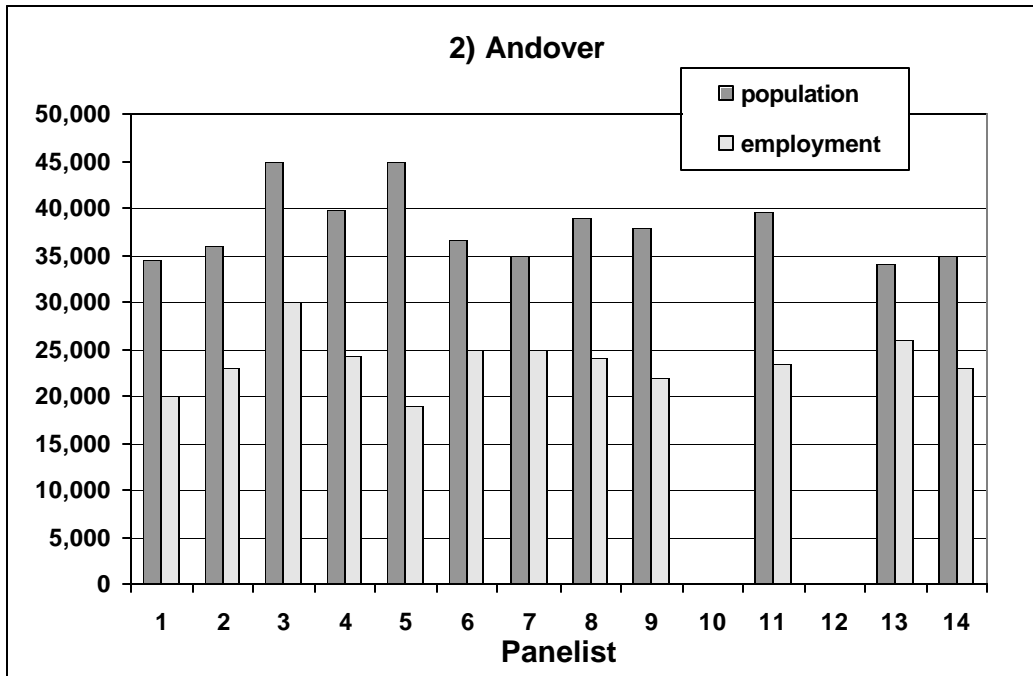as a function of distance from a major corridor, than might individuals, in making housing choices.

The following communities in the study area will see a substantial increase in employment potential as a result of the proposed improvements to I-93: **Bedford**, **Derry**, **Hooksett**, **Londonderry**, **Windham**.

The following communities in the study area will see a minor increase in employment potential as a result of the proposed improvements to I-93: **Andover**, **Auburn**, **Bow**, **Hampstead**, **Methuen**, **Pelham**, **Salem**.

The following communities in the study area will see a substantial increase in population potential as a result of the proposed improvements to I-93: **Auburn**, **Bow**, **Candia**, **Chester**, **Goffstown**, **Hooksett**, **Londonderry**.

The following communities in the study area will see a minor increase in population potential as a result of the proposed improvements to I-93: **Bedford**, **Derry**, **Hampstead**, **Pelham**, **Pembroke**, **Salem**.

Phase II Allocations by Panelist

This section shows the panelists' allocations for the 2020 Build Alternative (population and employment) by municipality, beginning with the study area as a whole.[6] The last two graphs show the allocations for additional municipalities suggested by two of the panelist. As in Phase I, each panelist was assigned a number which is used to identify each panelist in the statements below. Note that the panel numbers for Phase II are not necessarily the same as those from Phase I.

Total for Study Area

1) Allenstown

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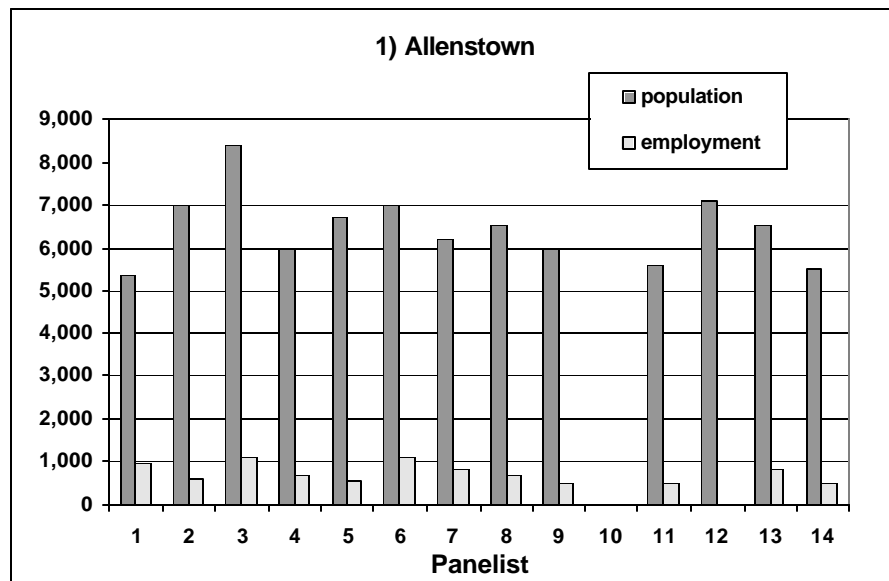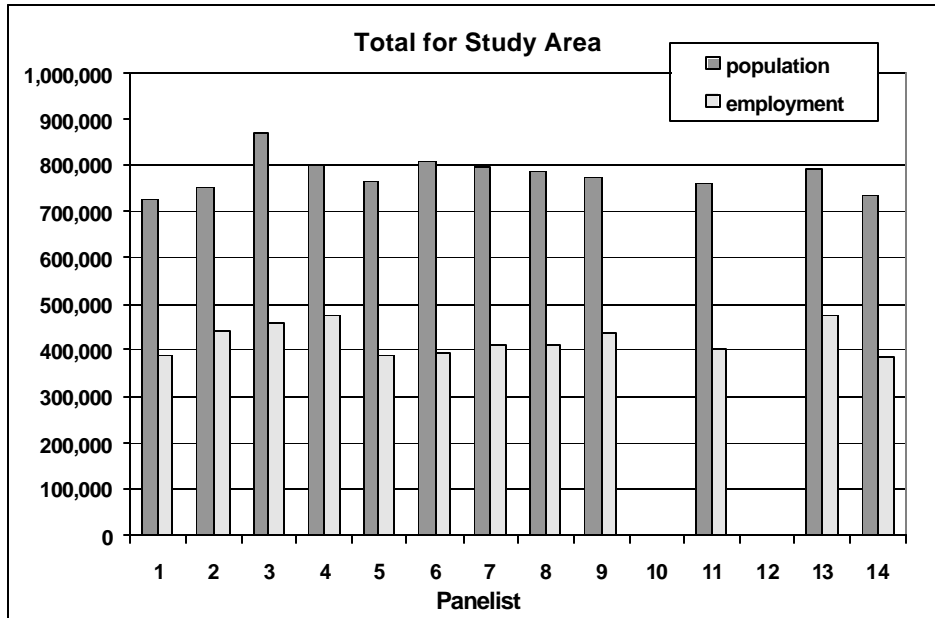
[6] Note, panelist number 10 did not do numeric allocations. Panelist number 12 carried out population allocations for NH municipalities only, and so these are not shown in this graph of the study area total.
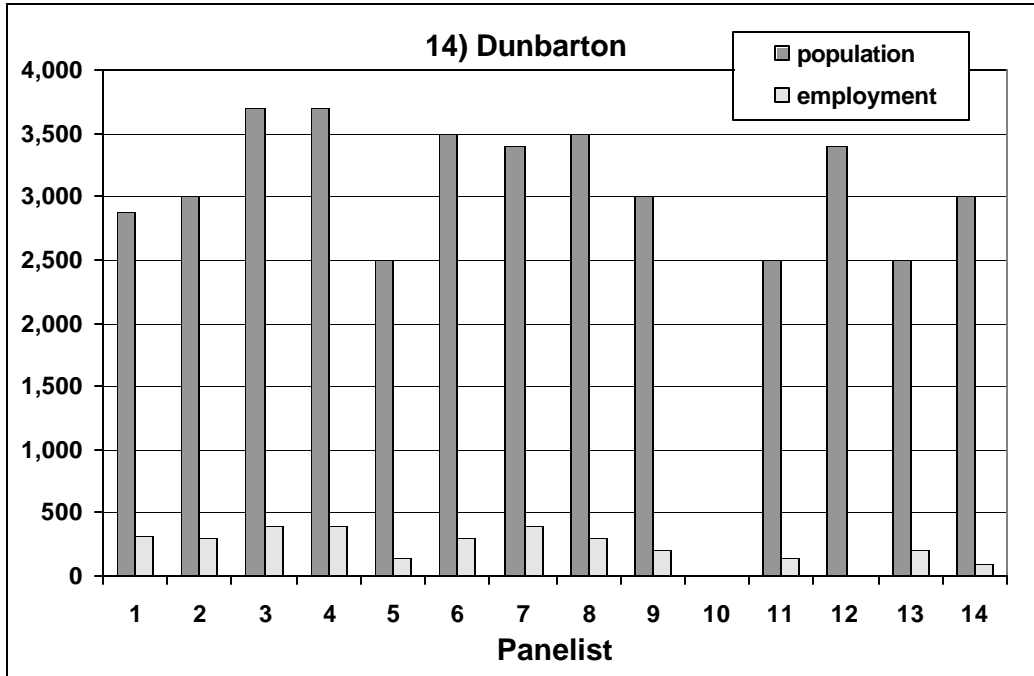
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2) Andover

3) Atkinson

4) Auburn

5) Bedford

6) Bow

7) Candia

8) Chester

9) Concord

10) Danville

11) Deerfield

12) Derry

13) Dracut

14) Dunbarton

15) Goffstown

16) Hampstead

17) Hooksett

18) Lawrence

19) Londonderry

20) Manchester

21) Methuen

22) North Andover

23) Pelham

24) Pembroke

25) Raymond

26) Salem

27) Sandown

28) Tewksbury

29) Windham

Additional Zones

Panelist 4 Additional Zones
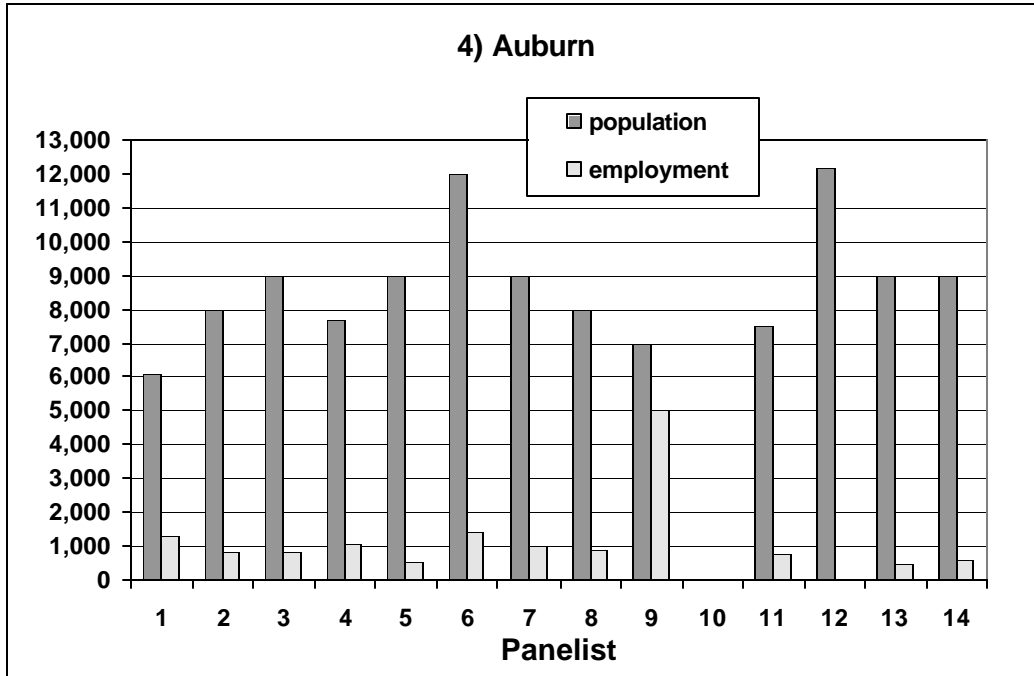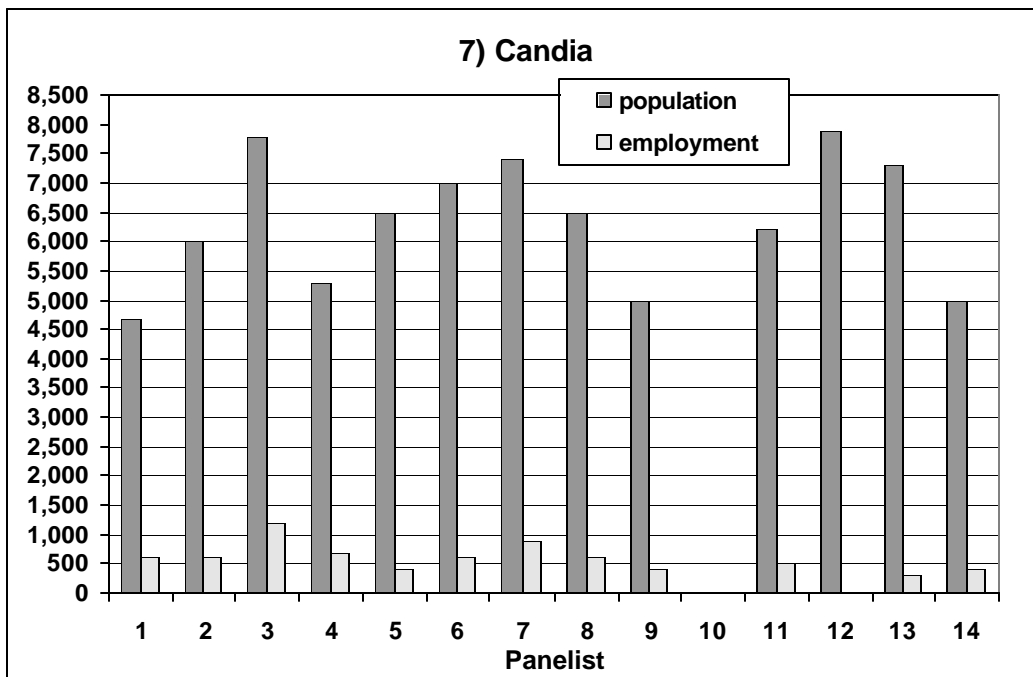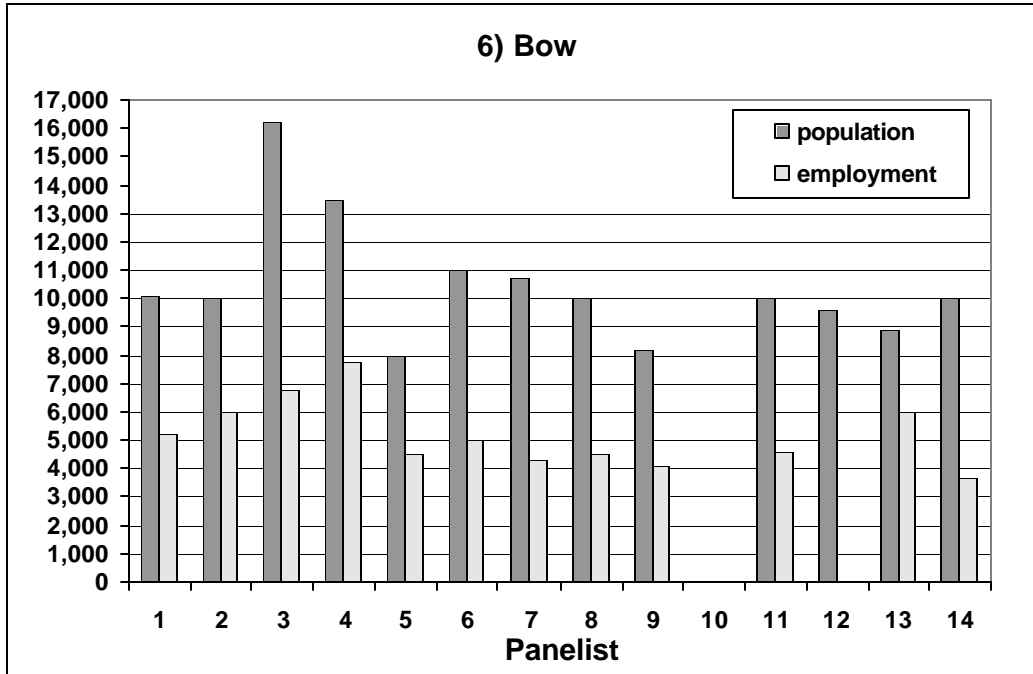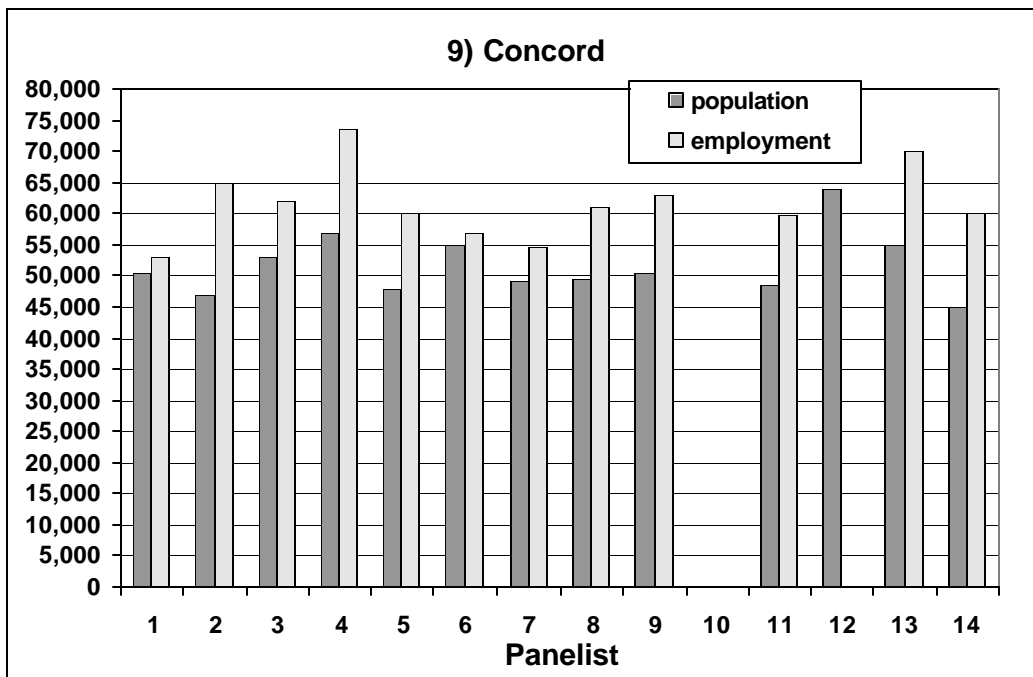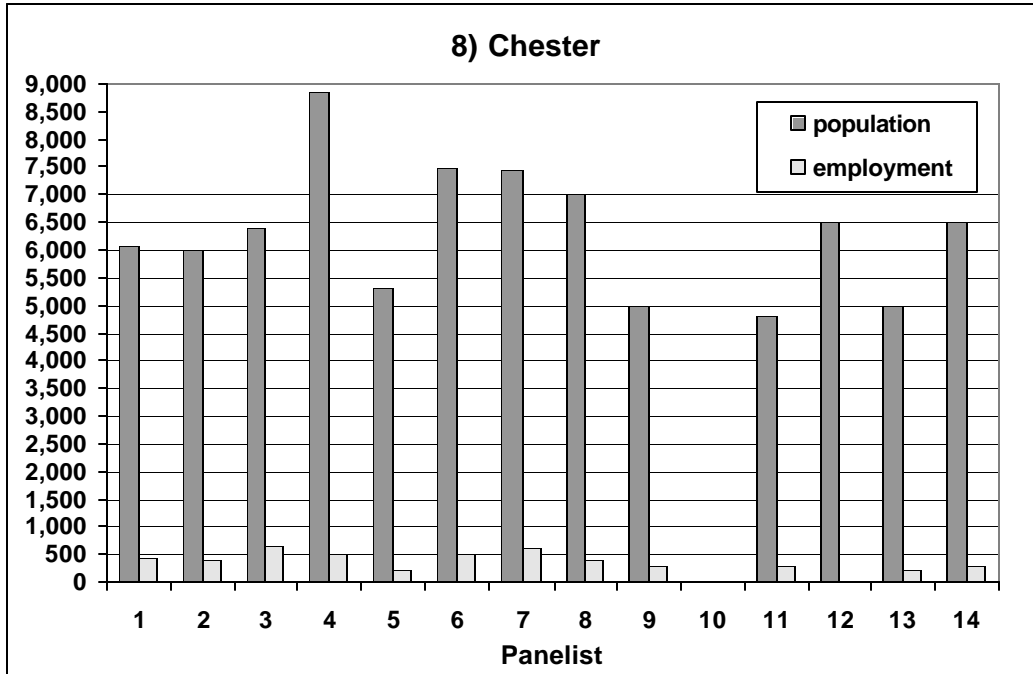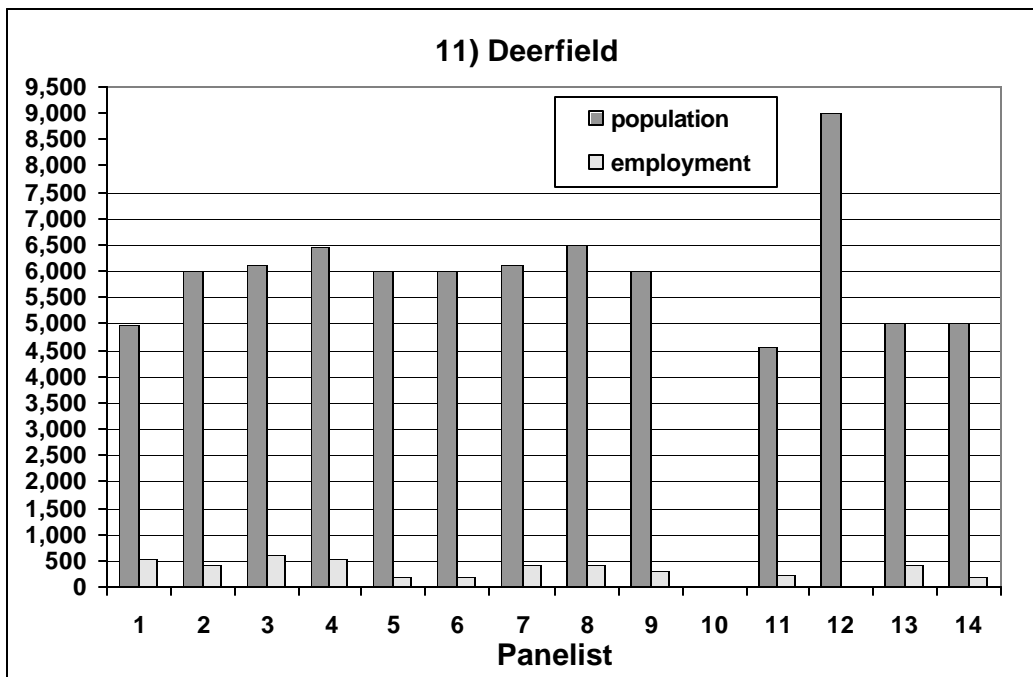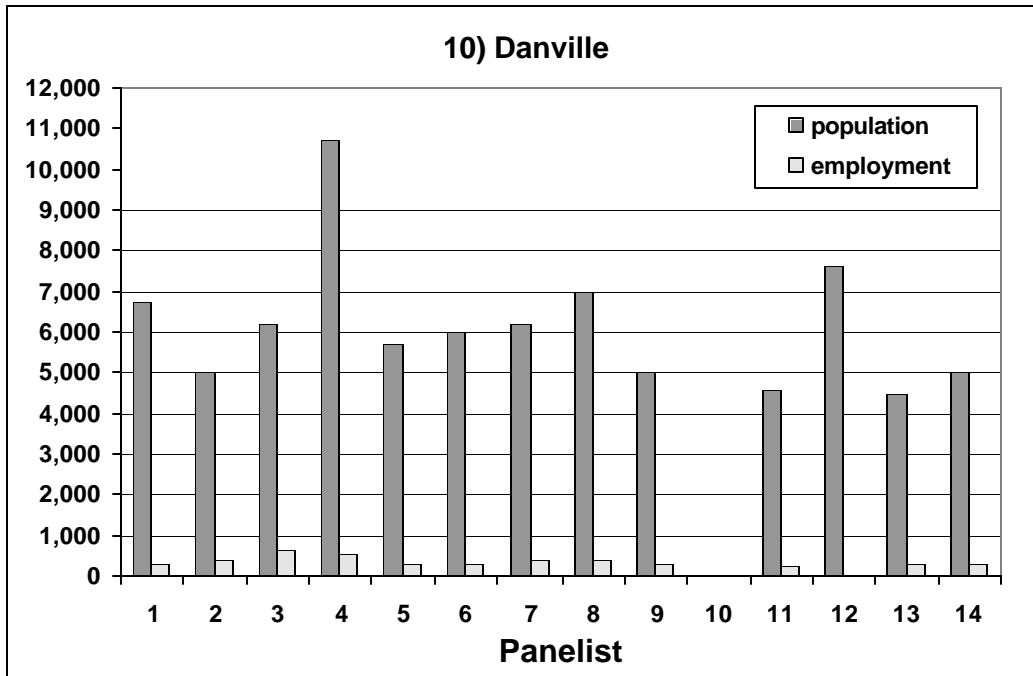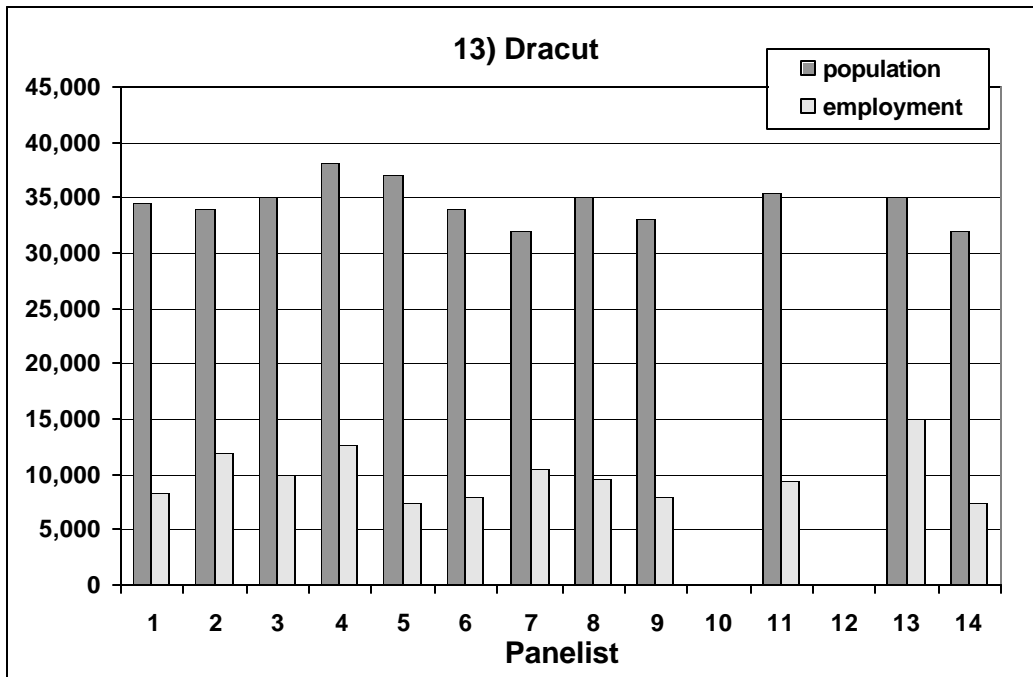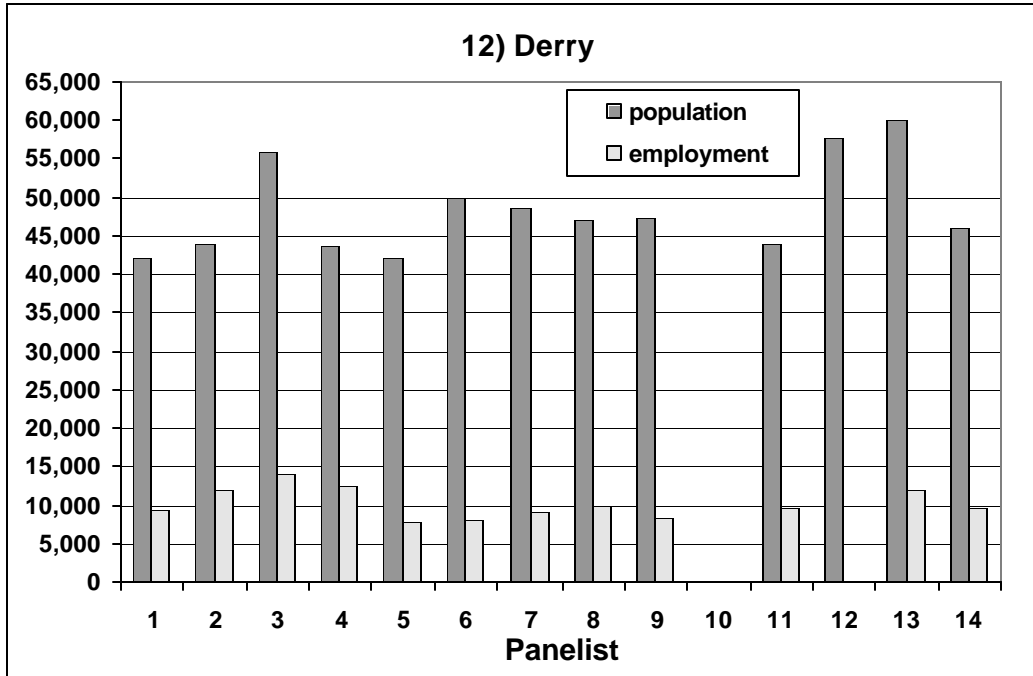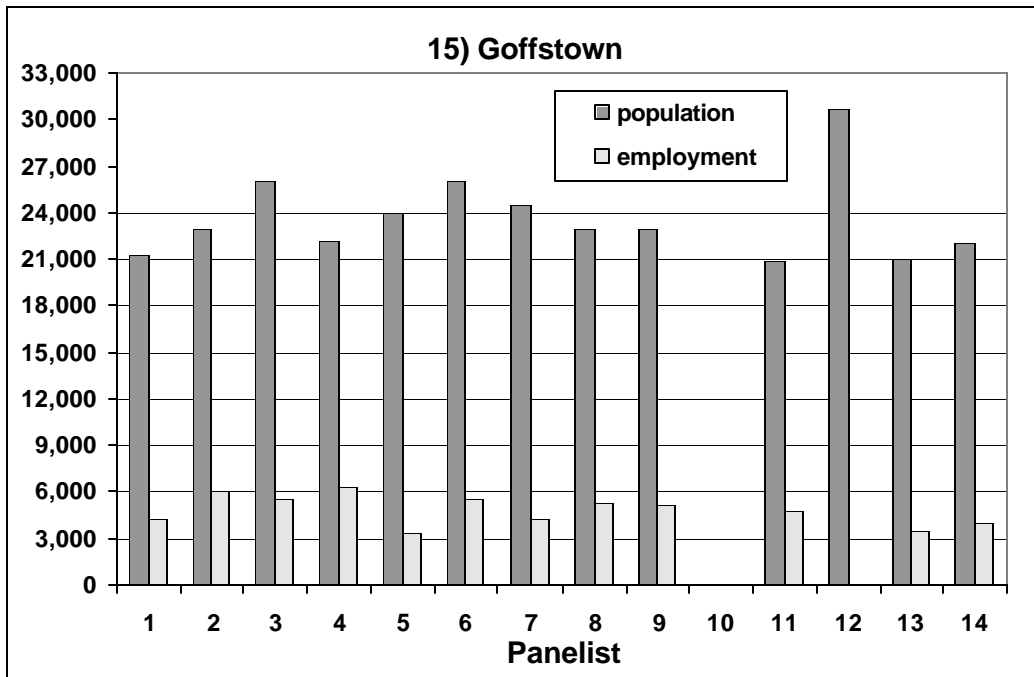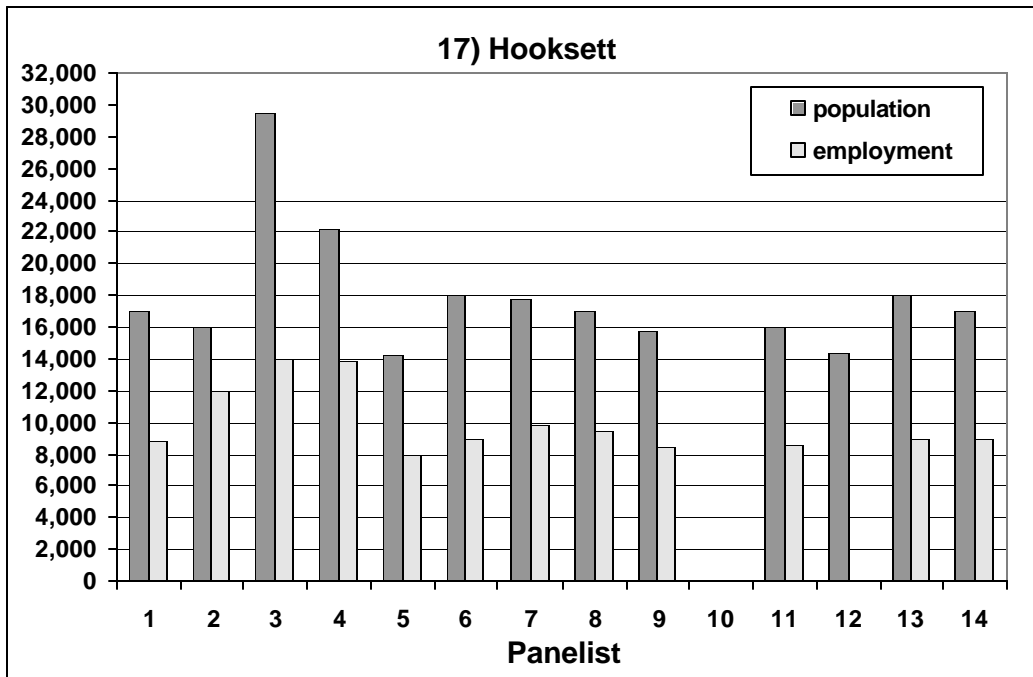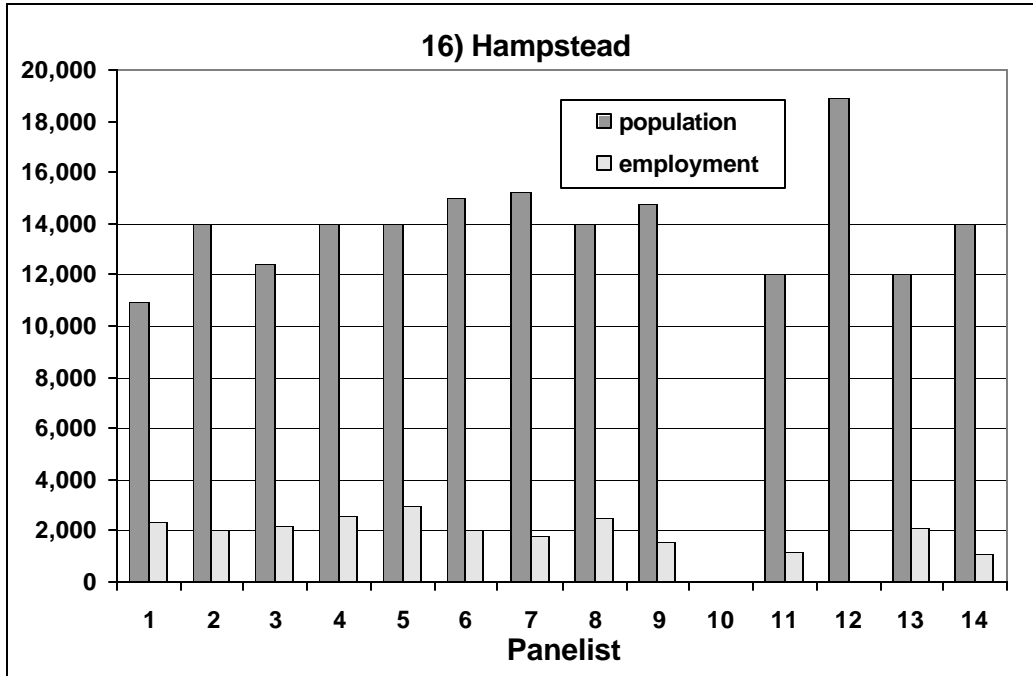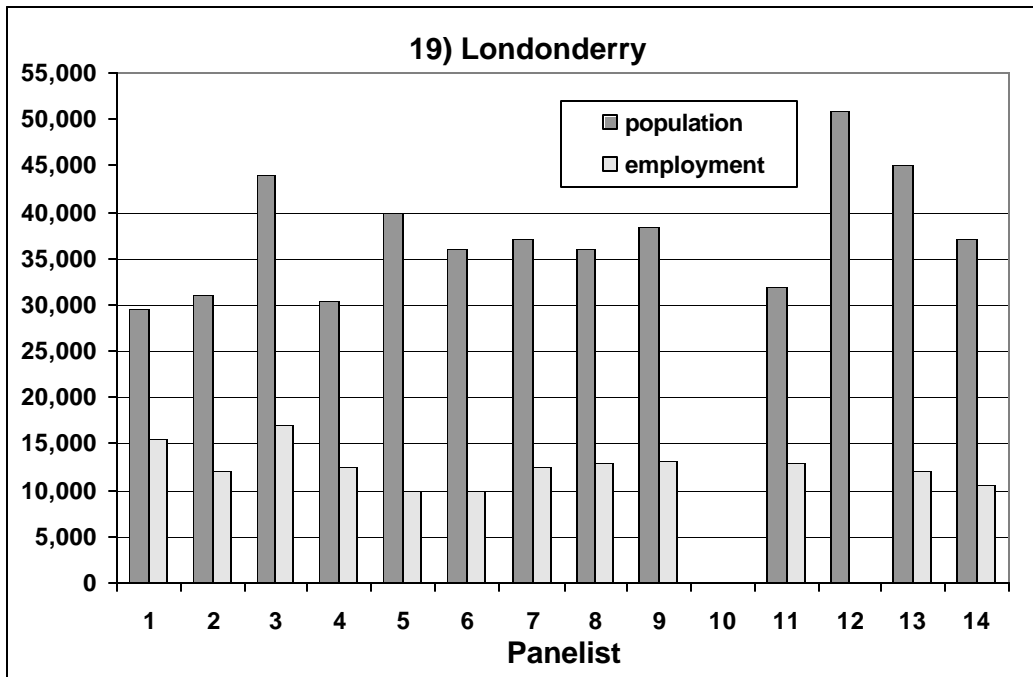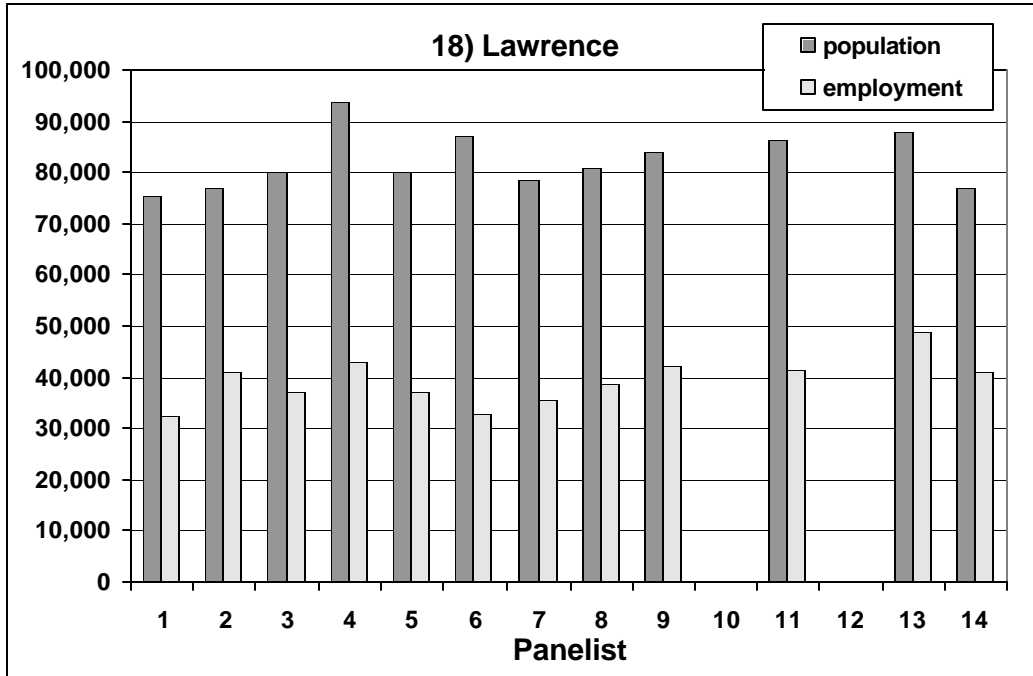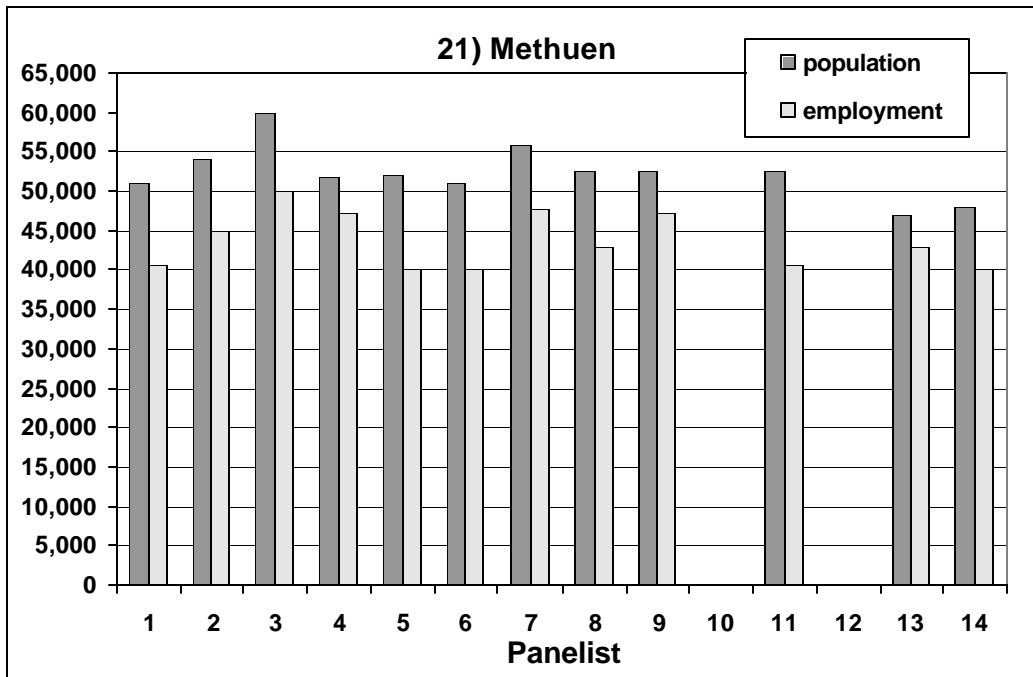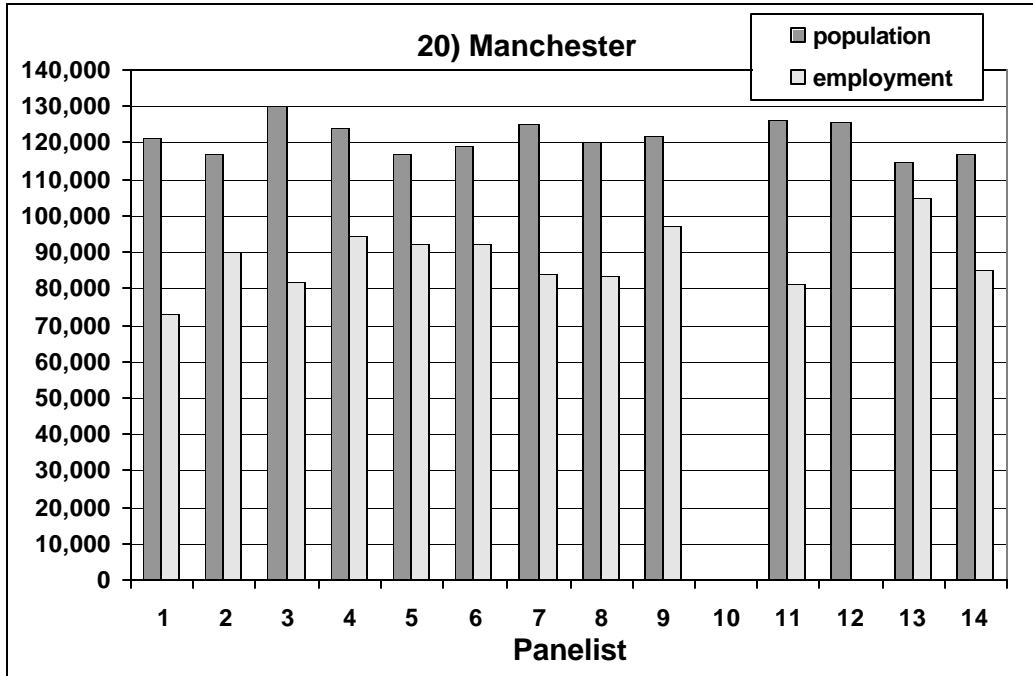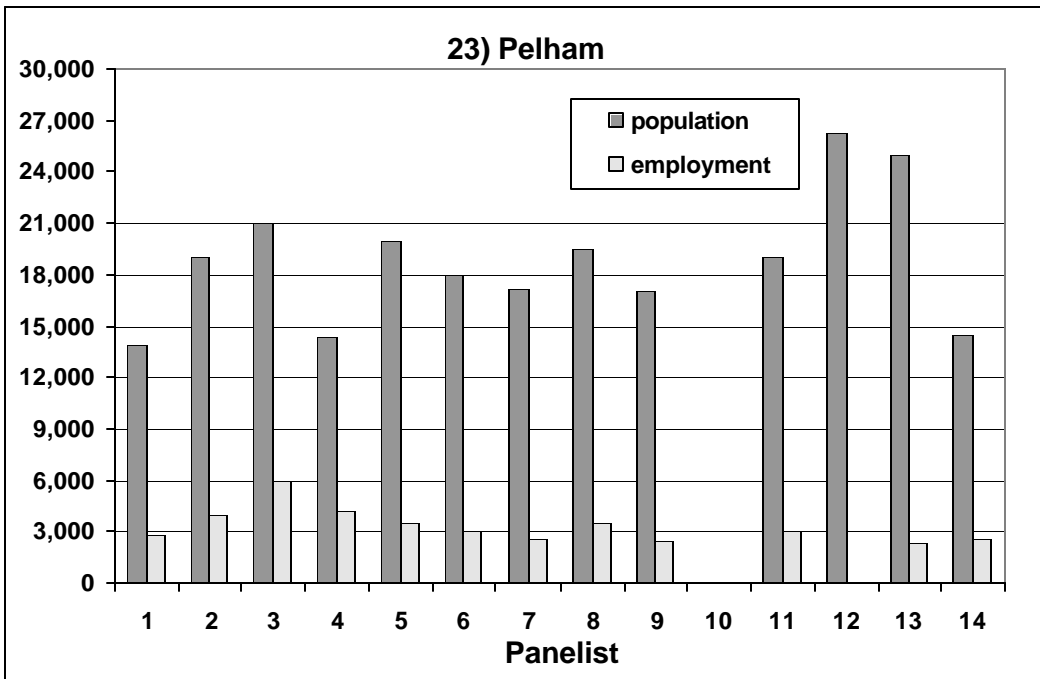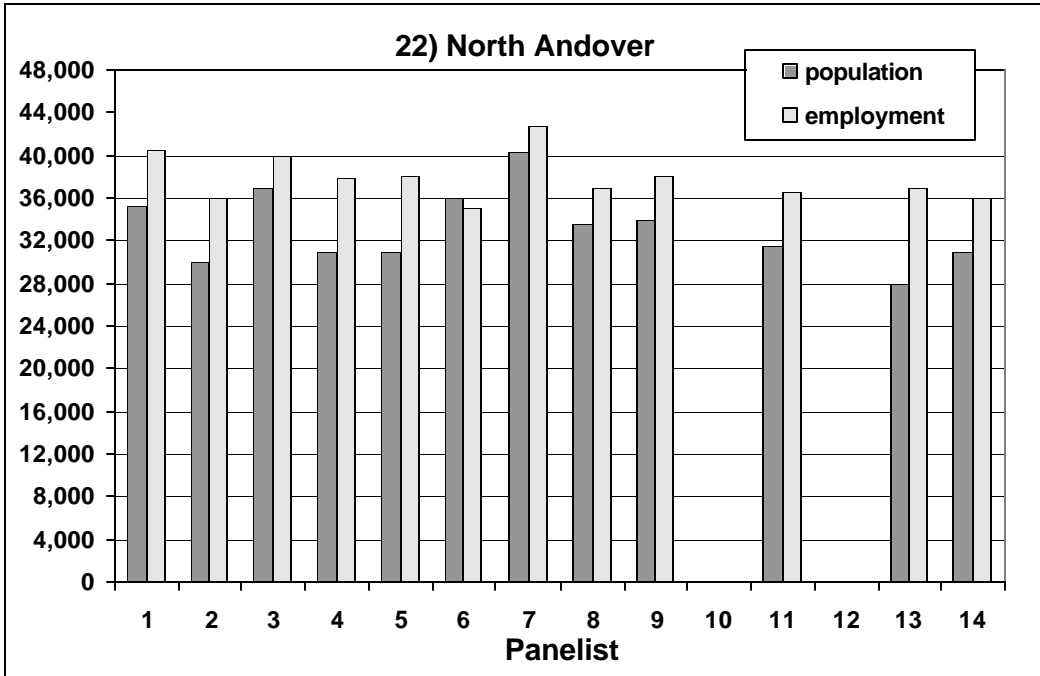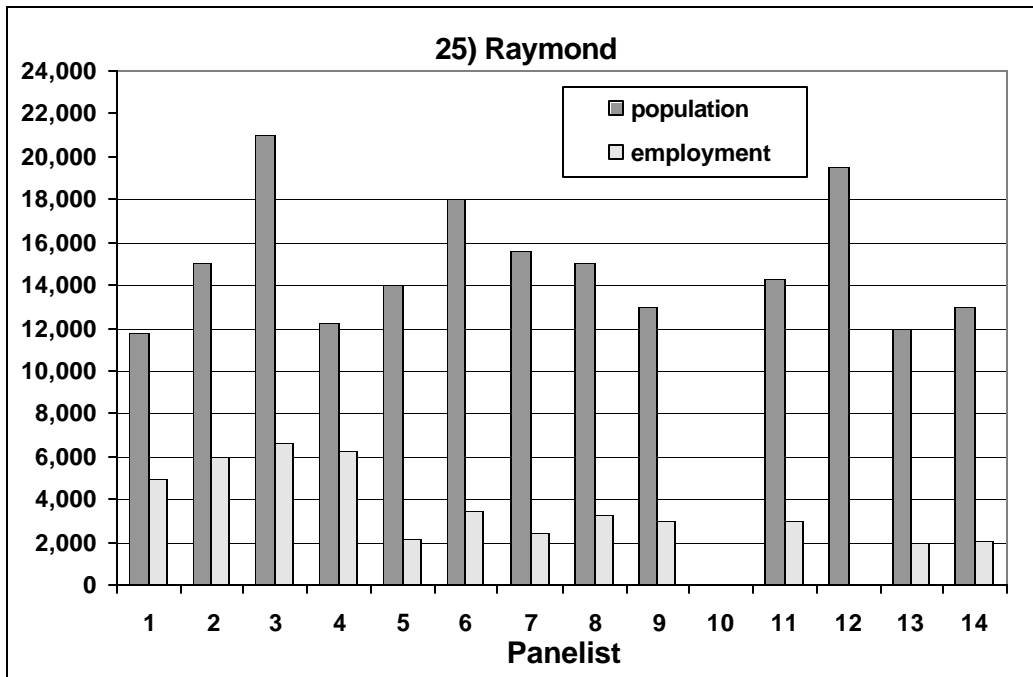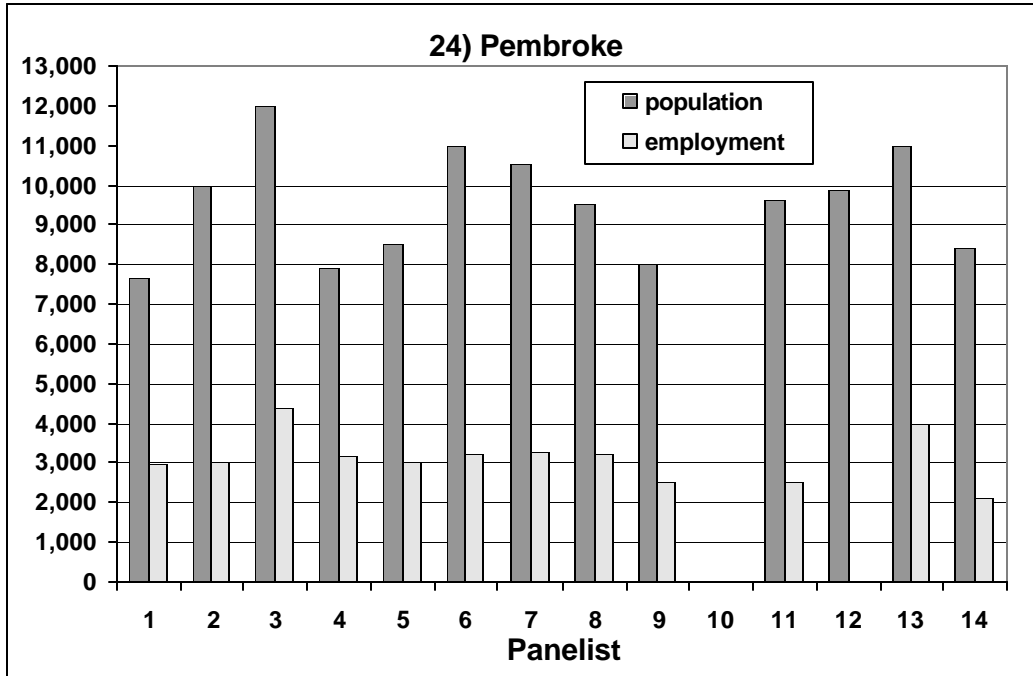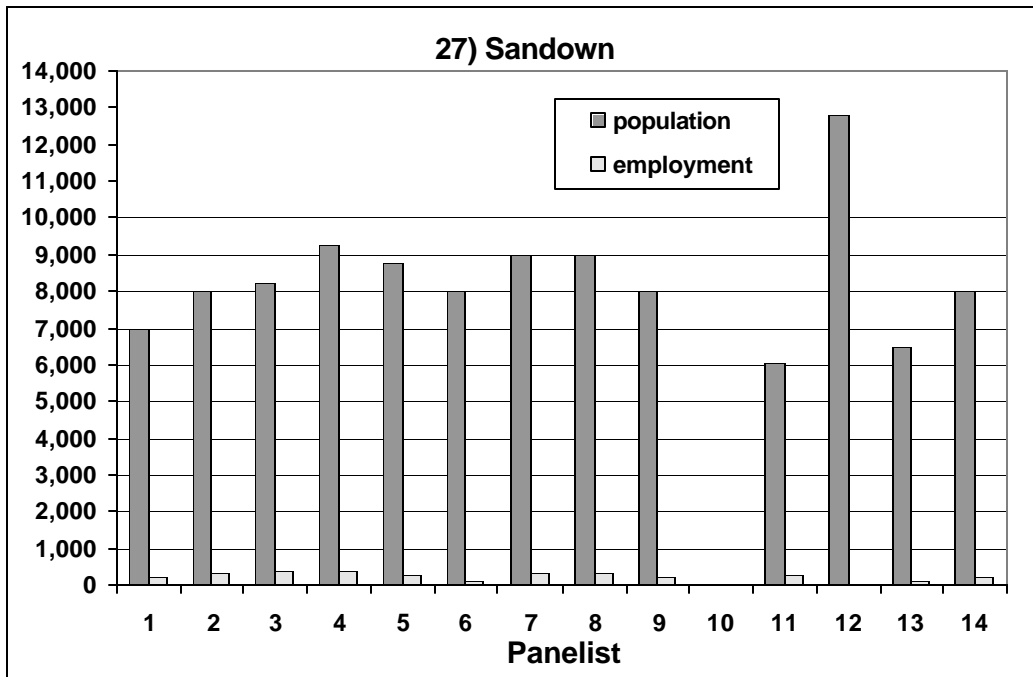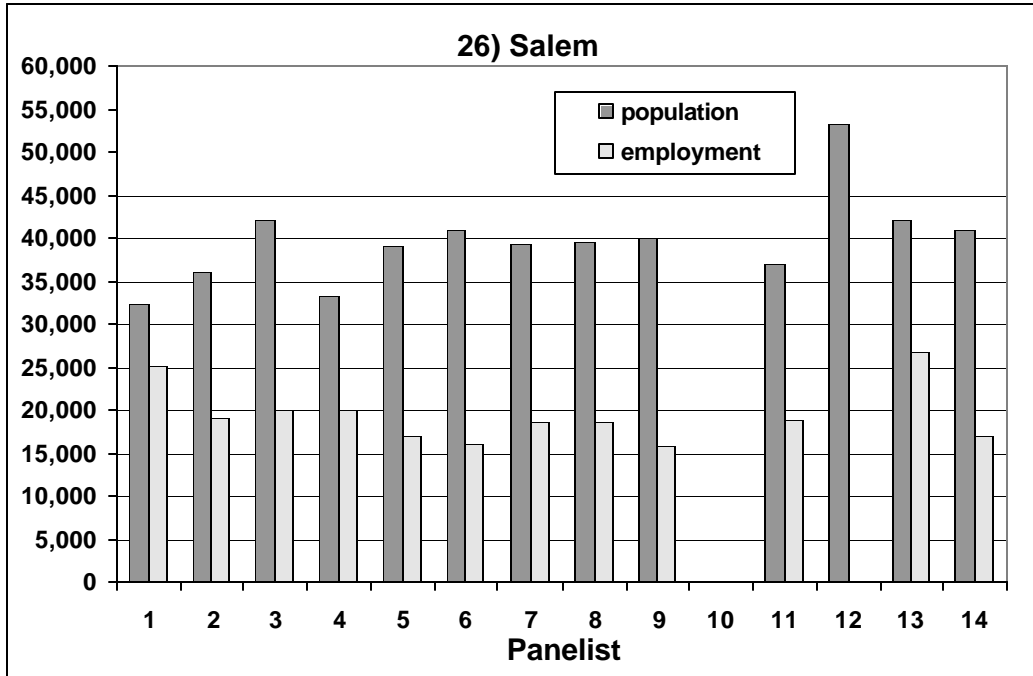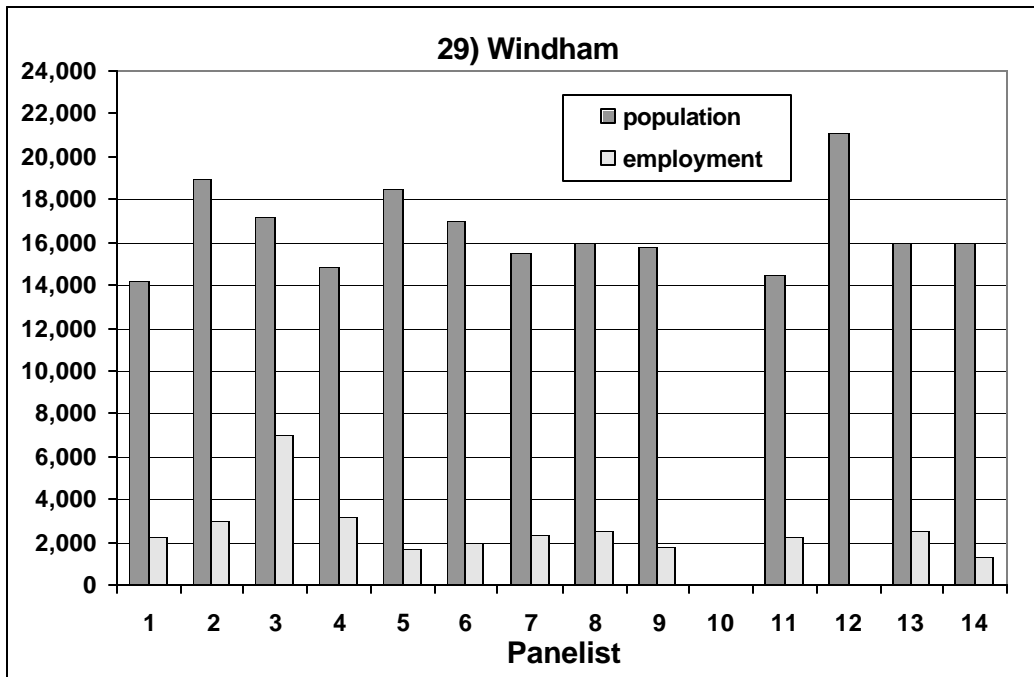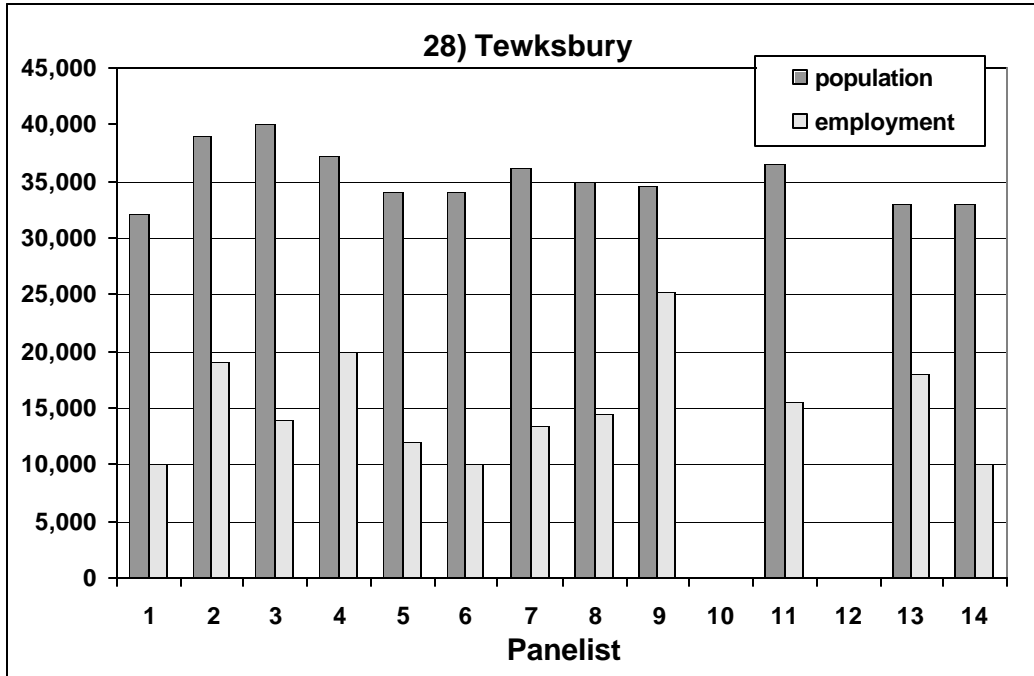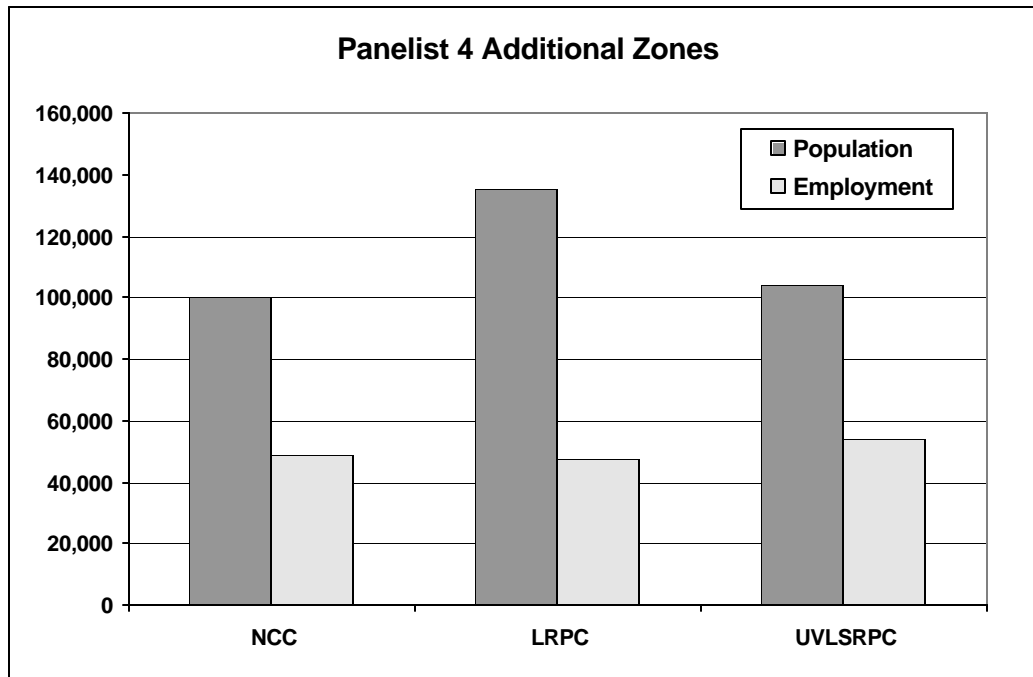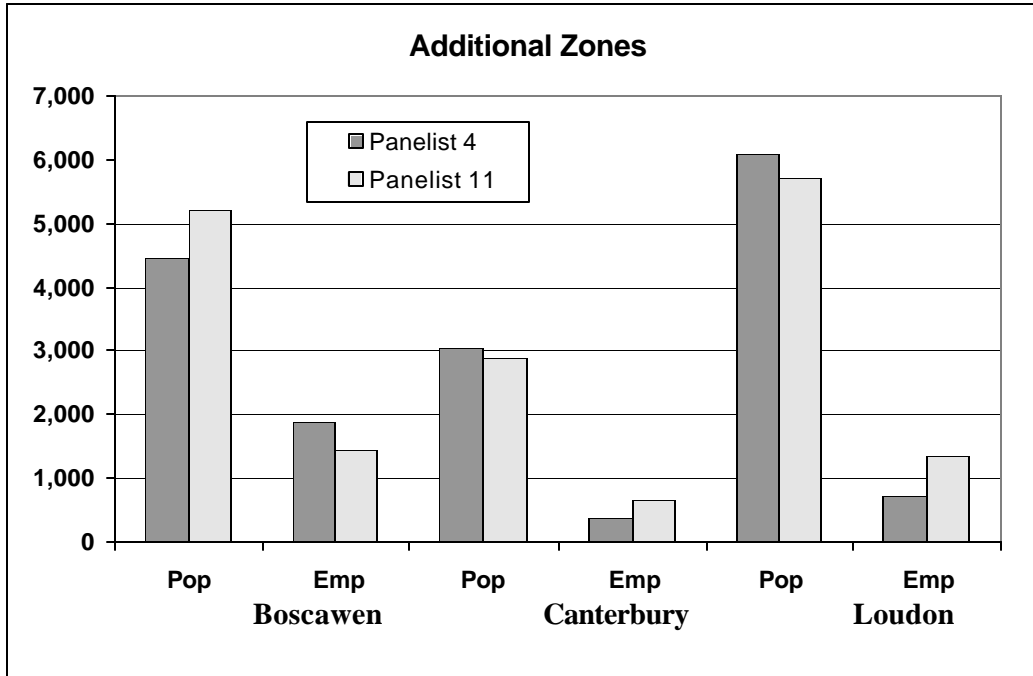
NCC: North Country Council, **LRPC:** Lakes Region RPC, **UVLSRPC:** Upper Valley Lake Sunapee RPC

Phase II Panelists' Blended Average Allocation and Variation

This part of the Appendix to Phase II contains four sections which show different aspects of the Panelists' Blended Average Allocation (PBAA) as well as variation issues.

Phase II Panelists' Blended Average Allocation and Minimum and Maximum

The following graphs show the 2020 PBAA as well as the Minimum and Maximum allocation for each municipality, beginning with the study area as a whole. The derivation of the PBAA, which expresses a "blended average" of the panelists' allocations, is described in the last Appendix to this document. The Minimum and Maximum allocations are shown in order to provide a sense of the variation among the panelists' allocations.
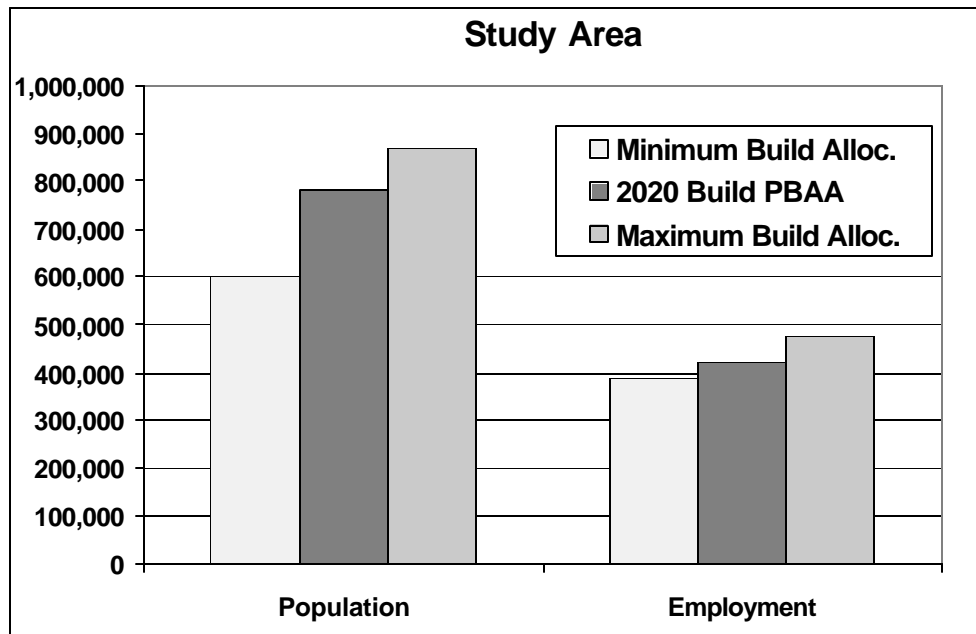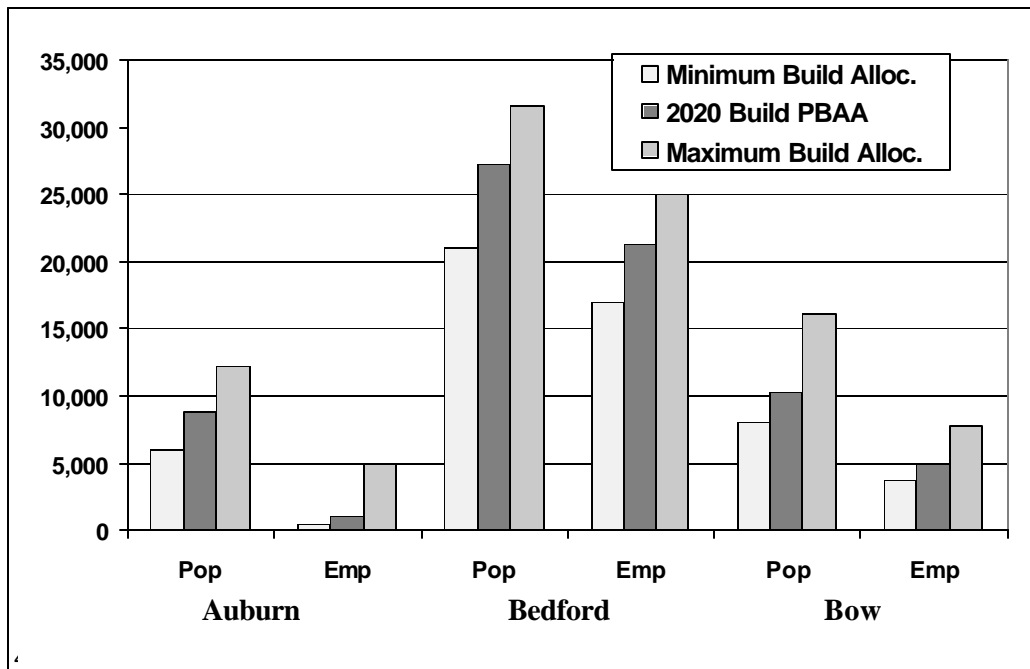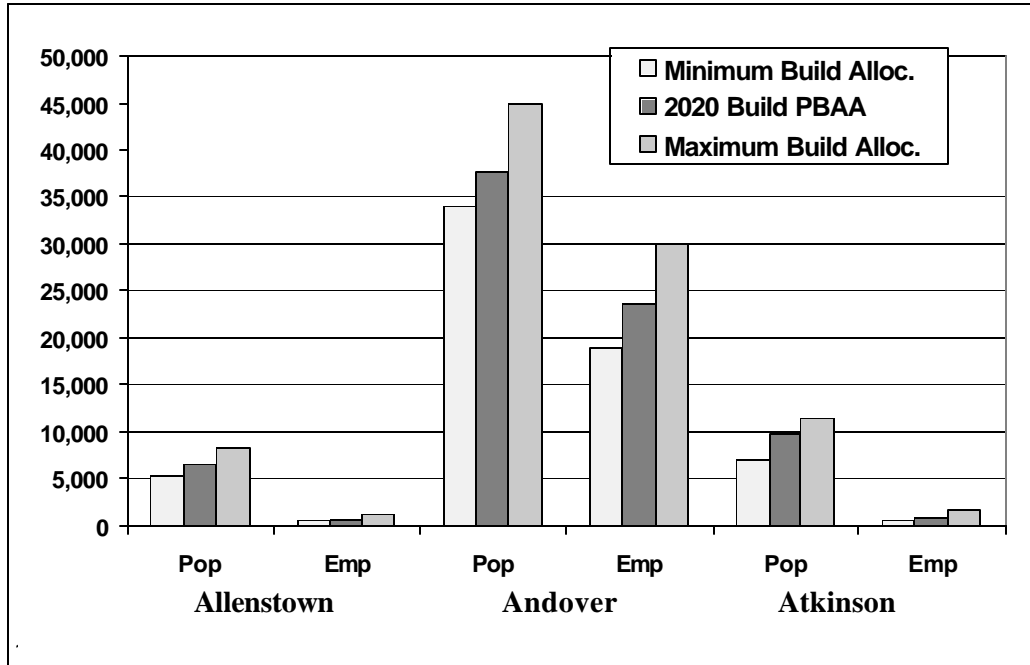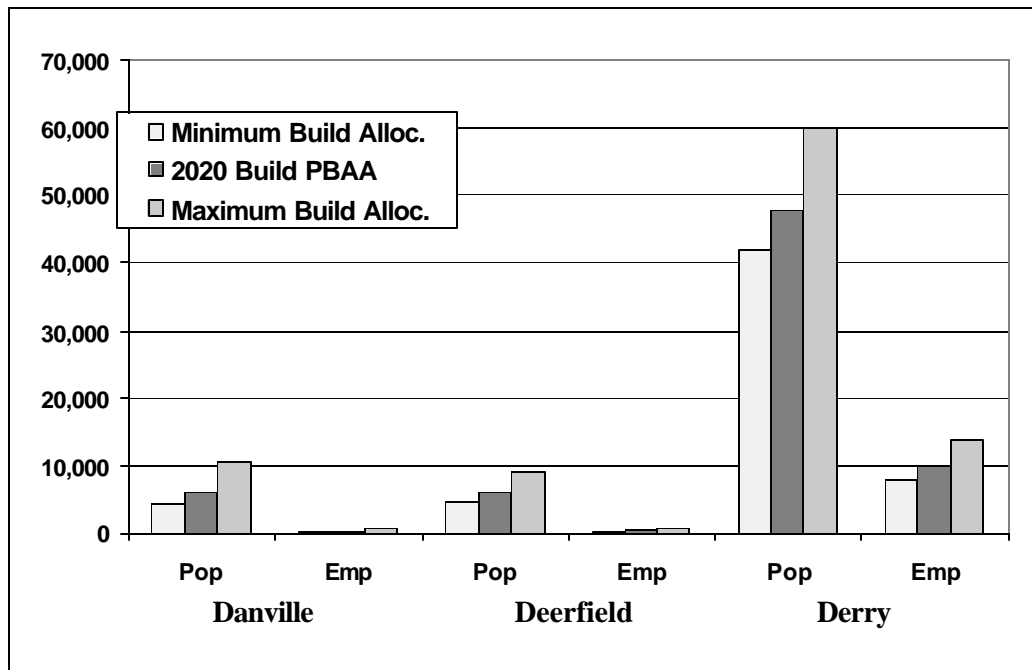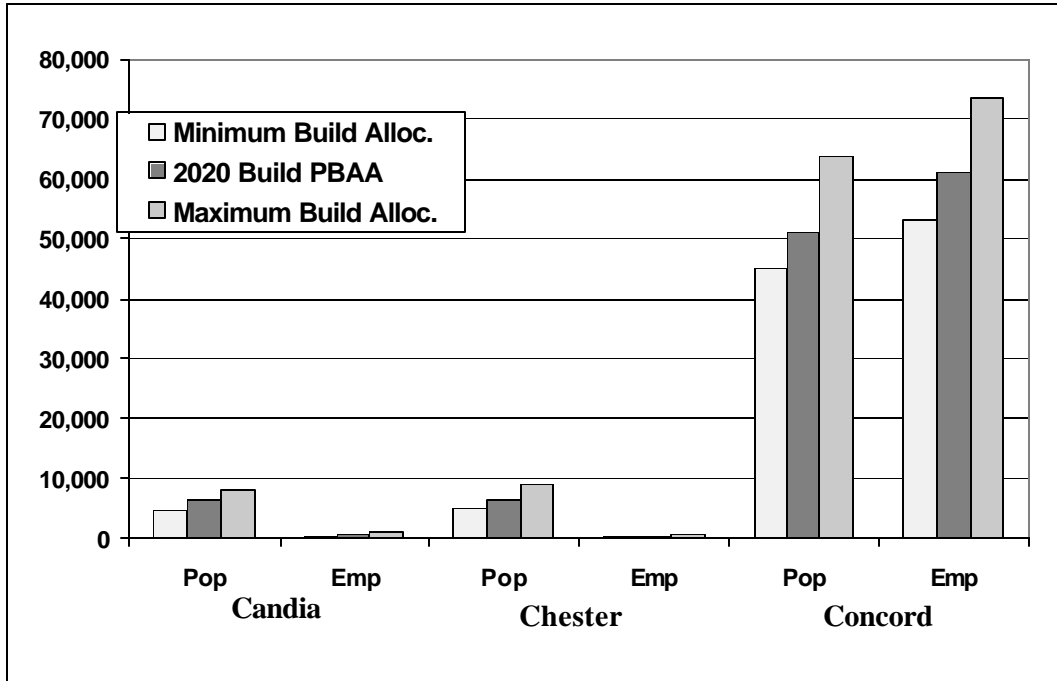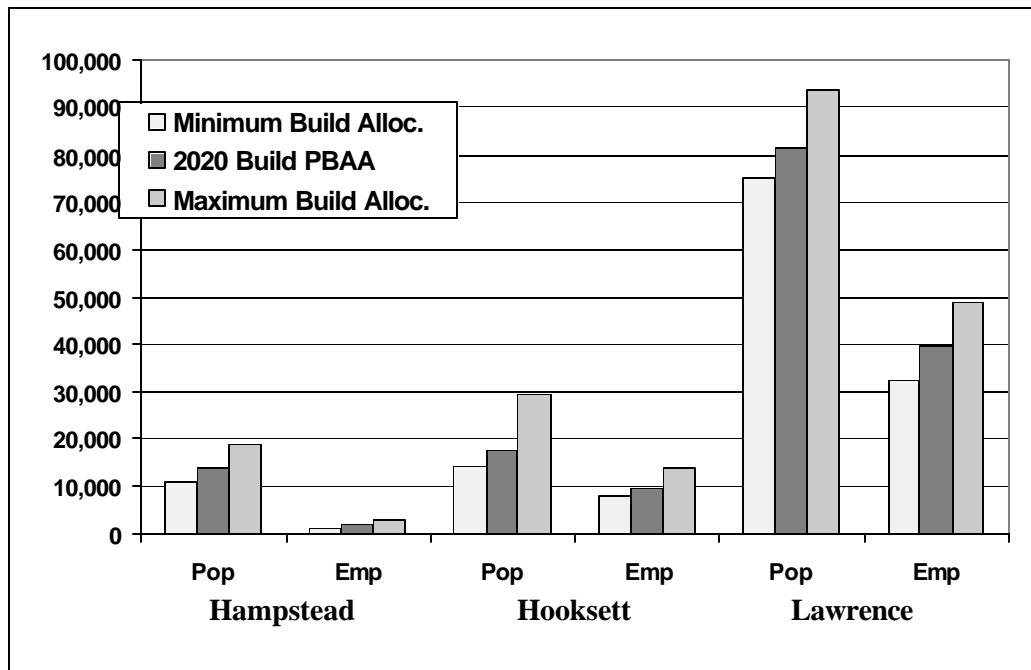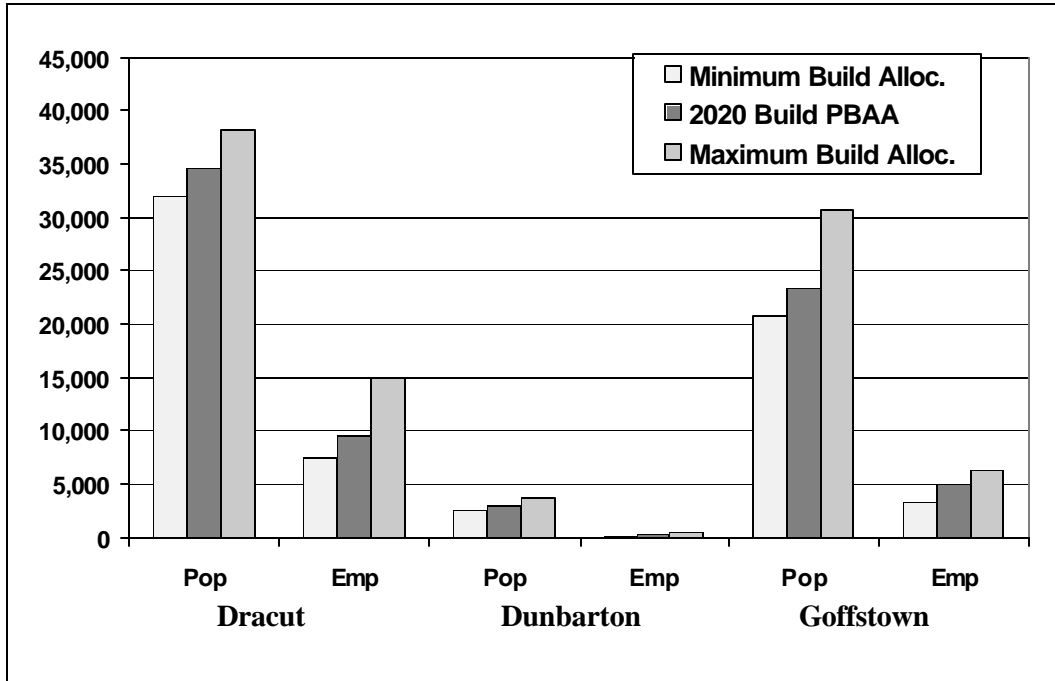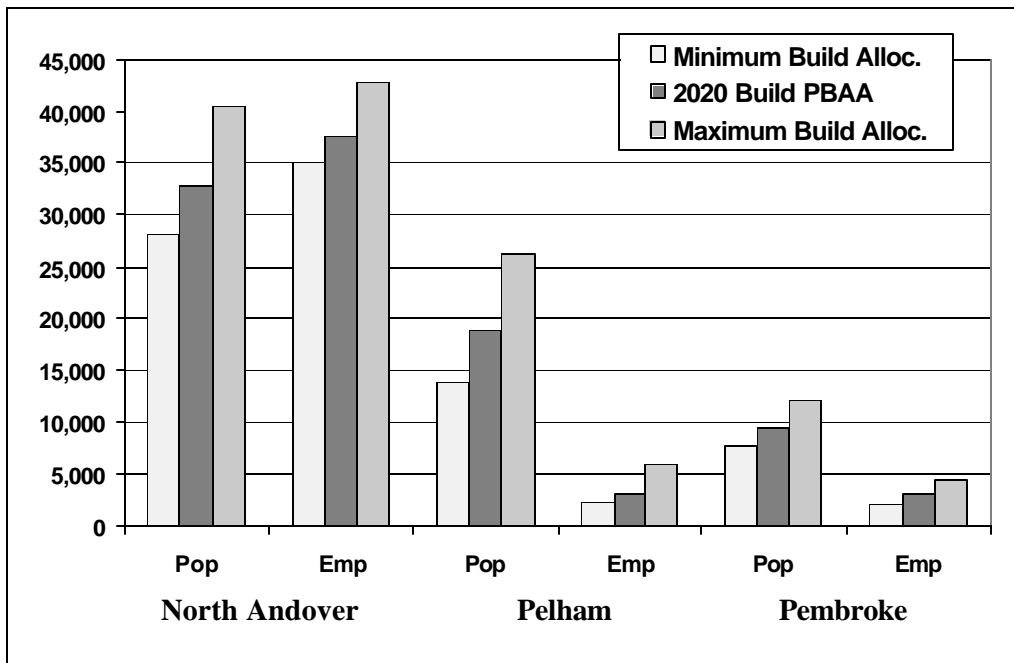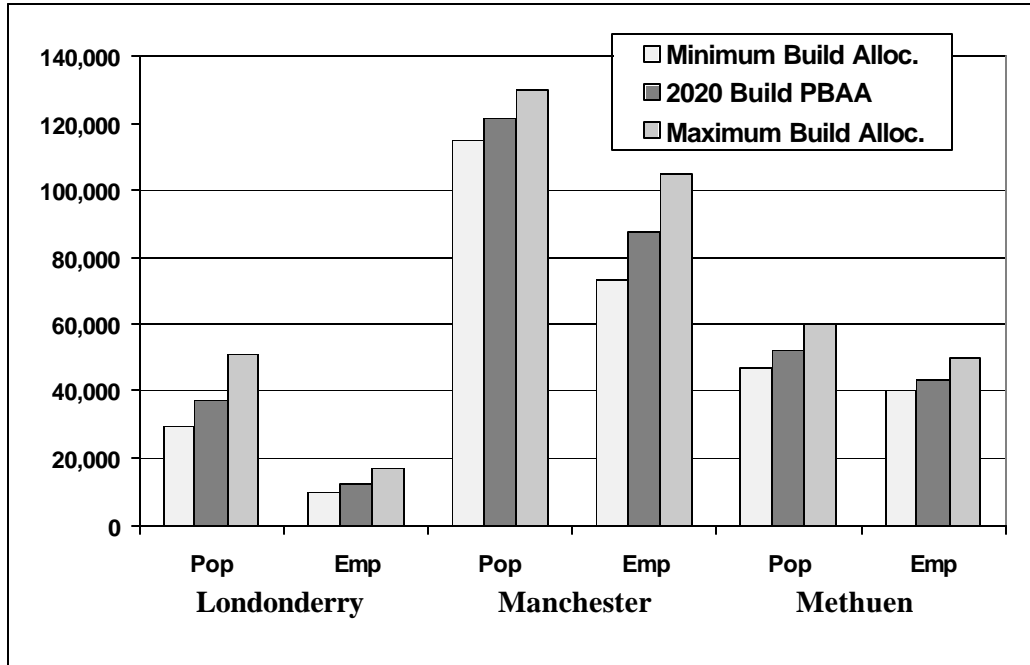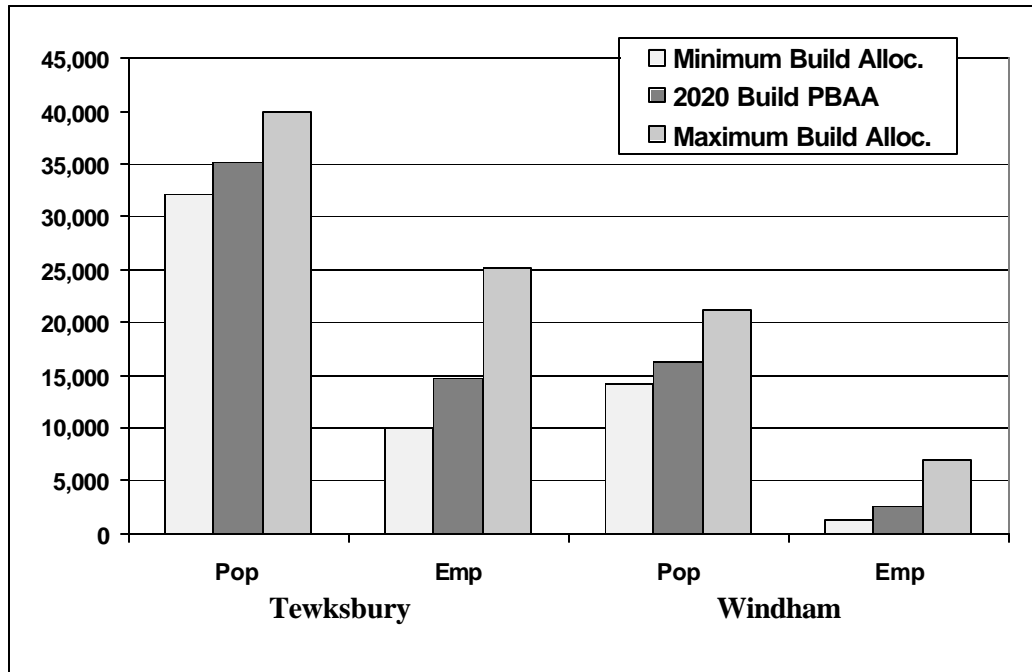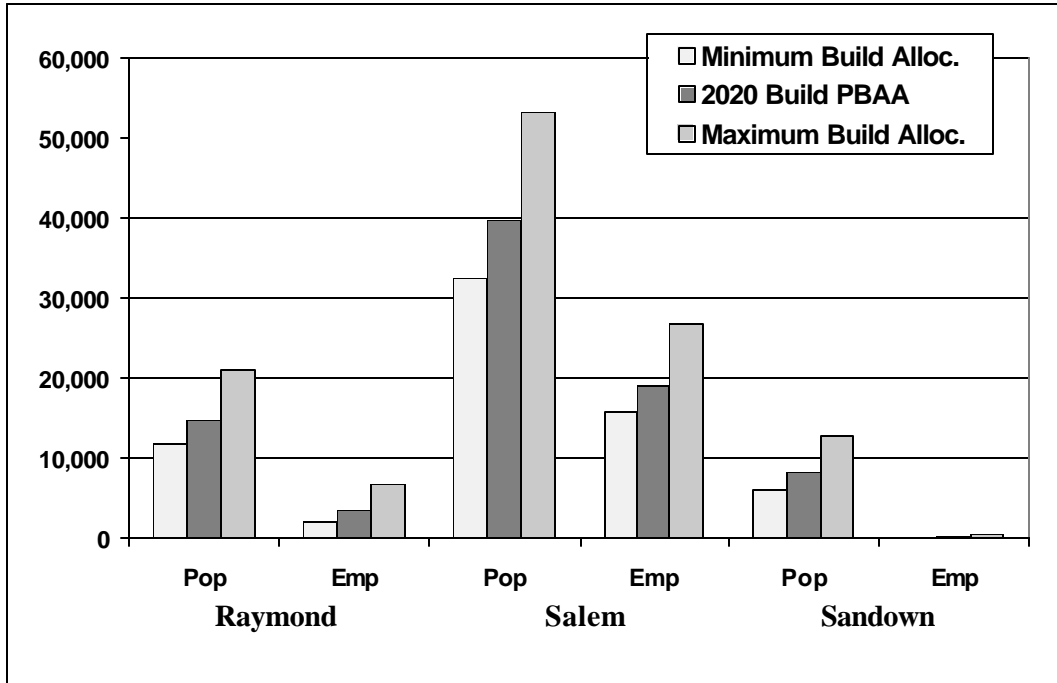
Phase II Statistics by Municipality

The following tables show the statistics behind the 2020 Build Alternative Panelists' Blended Average Allocation (PBAA) and the Minimum and Maximum allocations. As described in the next-to-last Appendix to this report, the PBAA equals the Mean plus the Median divided by two.

	TOTAL[1]	
	Population	Employment
Mean	767,260	422,736
Median	775,100	412,900
Minimum	603,000	386,500
Maximum	871,300	474,252
PBAA	783,673	418,852

[1] The PBAA totals for population and employment are created by summing the PBAA across the 29 zones. Due to rounding, this results in slightly different figures (less than one percent) than would result from deriving the study area total PBAA using the total mean and median.

	1) Allenstown		2) Andover		3) Atkinson	
	Population	Employment	Population	Employment	Population	Employment
Mean	6,444	732	38,082	23,711	9,514	887
Median	6,500	691	37,150	23,700	10,000	862
Minimum	5,330	500	34,000	19,000	7,000	475
Maximum	8,400	1,100	45,000	30,000	11,300	1,700
PBAA	6,472	711	37,616	23,705	9,757	875

	4) Auburn		5) Bedford		6) Bow	
	Population	Employment	Population	Employment	Population	Employment
Mean	8,730	1,219	26,871	21,100	10,474	5,205
Median	9,000	875	27,500	21,500	10,000	4,800
Minimum	6,100	500	21,000	17,000	8,000	3,700
Maximum	12,200	5,000	31,658	25,000	16,200	7,763
PBAA	8,865	1,047	27,186	21,300	10,237	5,003

	7) Candia		8) Chester		9) Concord	
	Population	Employment	Population	Employment	Population	Employment
Mean	6,349	602	6,337	400	51,644	61,603
Median	6,500	600	6,400	400	50,350	60,500
Minimum	4,660	300	4,800	200	45,000	53,140
Maximum	7,900	1,200	8,844	650	63,800	73,700
PBAA	6,425	601	6,369	400	50,997	61,052

	10) Danville		11) Deerfield		12) Derry	
	Population	Employment	Population	Employment	Population	Employment
Mean	6,170	370	5,977	365	48,345	10,202
Median	6,000	310	6,000	400	47,000	9,550
Minimum	4,500	250	4,550	200	42,000	7,900
Maximum	10,707	650	9,000	620	60,000	14,000
PBAA	6,085	340	5,989	383	47,672	9,876

	13) Dracut		14) Dunbarton		15) Goffstown	
	Population	Employment	Population	Employment	Population	Employment
Mean	34,601	9,852	3,121	269	23,656	4,826
Median	34,750	9,450	3,000	300	23,000	5,000
Minimum	32,000	7,500	2,500	100	20,900	3,300
Maximum	38,215	15,000	3,700	403	30,700	6,300
PBAA	34,676	9,651	3,061	284	23,328	4,913

	16) Hampstead		17) Hooksett		18) Lawrence	
	Population	Employment	Population	Employment	Population	Employment
Mean	13,941	2,032	17,910	9,993	82,359	39,265
Median	14,000	2,050	17,000	9,000	80,500	39,900
Minimum	10,970	1,100	14,200	8,000	75,410	32,430
Maximum	18,900	3,000	29,500	14,000	93,744	49,000
PBAA	13,970	2,041	17,455	9,497	81,429	39,583

	19) Londonderry		20) Manchester		21) Methuen	
	Population	**Employment**	**Population**	**Employment**	**Population**	**Employment**
Mean	37,500	12,616	121,577	88,267	52,358	43,710
Median	37,000	12,550	121,300	87,500	52,250	43,000
Minimum	29,490	10,000	115,000	73,200	47,000	40,000
Maximum	51,000	17,000	130,000	105,000	60,000	50,000
PBAA	**37,250**	**12,583**	**121,438**	**87,883**	**52,304**	**43,355**

	22) North Andover		23) Pelham		24) Pembroke	
	Population	**Employment**	**Population**	**Employment**	**Population**	**Employment**
Mean	33,213	37,888	18,822	3,331	9,539	3,116
Median	32,500	37,400	19,000	3,000	9,600	3,075
Minimum	28,000	35,000	13,860	2,300	7,660	2,100
Maximum	40,400	42,800	26,300	6,000	12,000	4,400
PBAA	**32,856**	**37,644**	**18,911**	**3,165**	**9,570**	**3,095**

	25) Raymond		26) Salem		27) Sandown	
	Population	**Employment**	**Population**	**Employment**	**Population**	**Employment**
Mean	14,949	3,779	39,675	19,367	8,348	251
Median	14,250	3,150	39,500	18,650	8,000	250
Minimum	11,760	2,000	32,400	15,750	6,050	100
Maximum	21,000	6,600	53,200	26,800	12,800	403
PBAA	**14,600**	**3,464**	**39,587**	**19,008**	**8,174**	**251**

	28) Tewksbury		29) Windham	
	Population	**Employment**	**Population**	**Employment**
Mean	35,399	15,142	16,587	2,638
Median	34,800	14,250	16,000	2,255
Minimum	32,190	9,990	14,190	1,300
Maximum	40,000	25,160	21,100	7,000
PBAA	**35,100**	**14,696**	**16,294**	**2,446**

Phase II Variation Issues

We show, in the table below, the final totals for both the No-build (from Phase I) and the Build Alternatives, for each panelist *who carried out an allocation for each municipality.* Note too that the assigned panel numbers shown in the left column of Table 4 are those for Phase II.

Table 4: Total Allocations by Panelist, 2020 No-build and 2020 Build

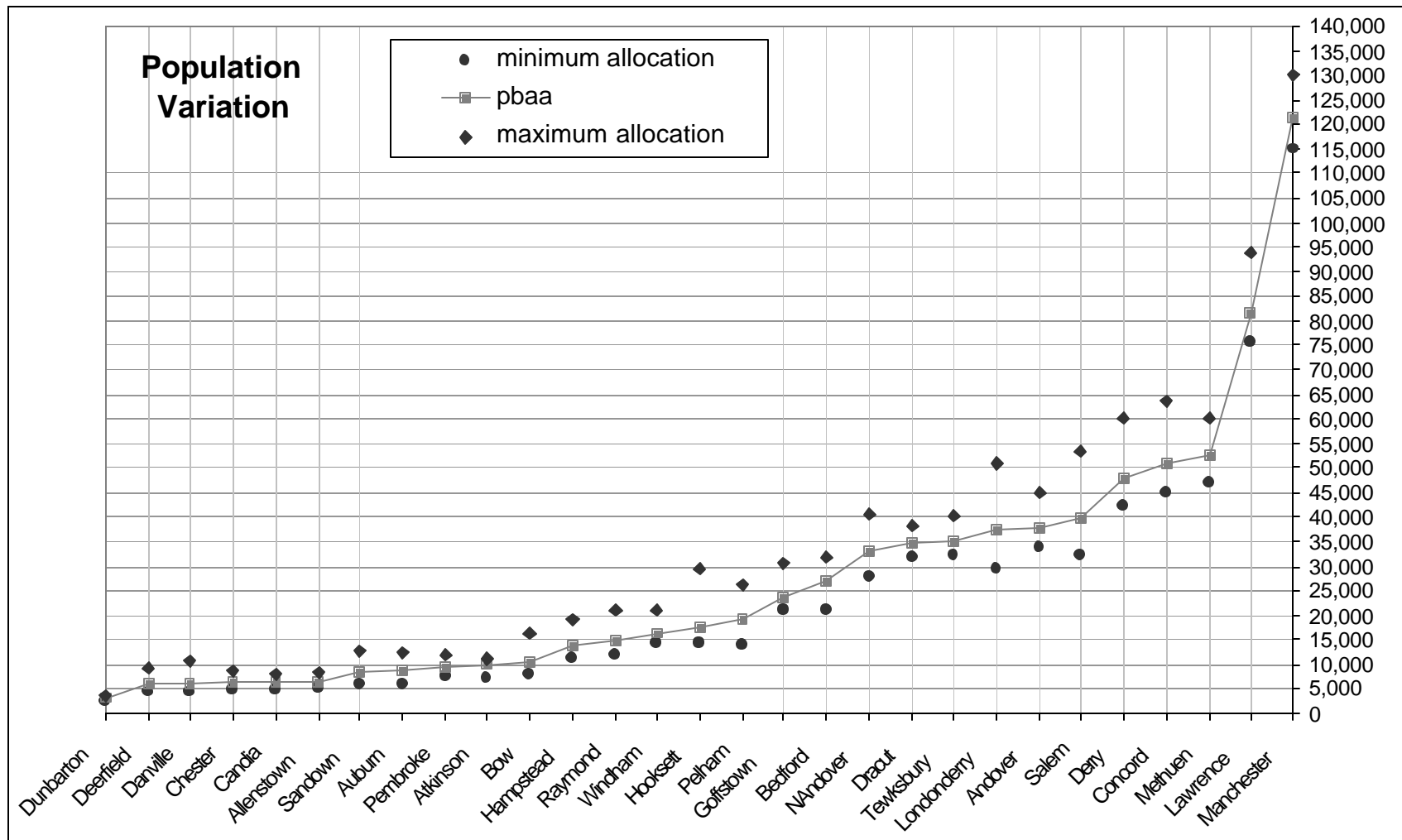| Panelist	2020 <u>No Build</u> Total Allocations	2020 <u>Build</u> Total Allocations	2020 <u>No Build</u> Total Allocations	2020 <u>Build</u> Total Allocations	Difference for Population	Difference for Employment
	population		employment			
1	714,900	725,890	379,100	387,180	10,990	8,080
2	753,000	753,000	442,600	442,600	0	0
3	863,100	871,300	441,400	457,620	8,200	16,220
4	751,321	799,844	446,640	474,252	48,523	27,612
5	707,350	765,650	349,635	389,635	58,300	40,000
6	762,000	808,500	368,100	394,850	46,500	26,750
7	752,450	799,650	390,200	411,600	47,200	21,400
8	---	784,500	---	414,200	---	---
9	745,000	775,100	419,900	437,530	30,100	17,630
10	---	---	---	---	---	---
11	748,000	762,850	392,260	403,160	14,850	10,900
12	---	---	---	---	---	---
13	727,600	792,200	416,050	473,700	64,600	57,650
14	715,000	732,900	370,600	386,500	17,900	15,900
Minimum	707,350	725,890	349,635	386,500	0	0
Maximum	863,100	871,300	446,640	474,252	64,600	57,650

The last two columns on the right show the each panelist's estimate of population and employment change for the study area as a whole, from the No-build to the Build alternative (for those panelists who carried out allocations for *each* municipality). The change in total population ranges from zero to over 64,000 while the change in total employment ranges from zero to over 57,000.
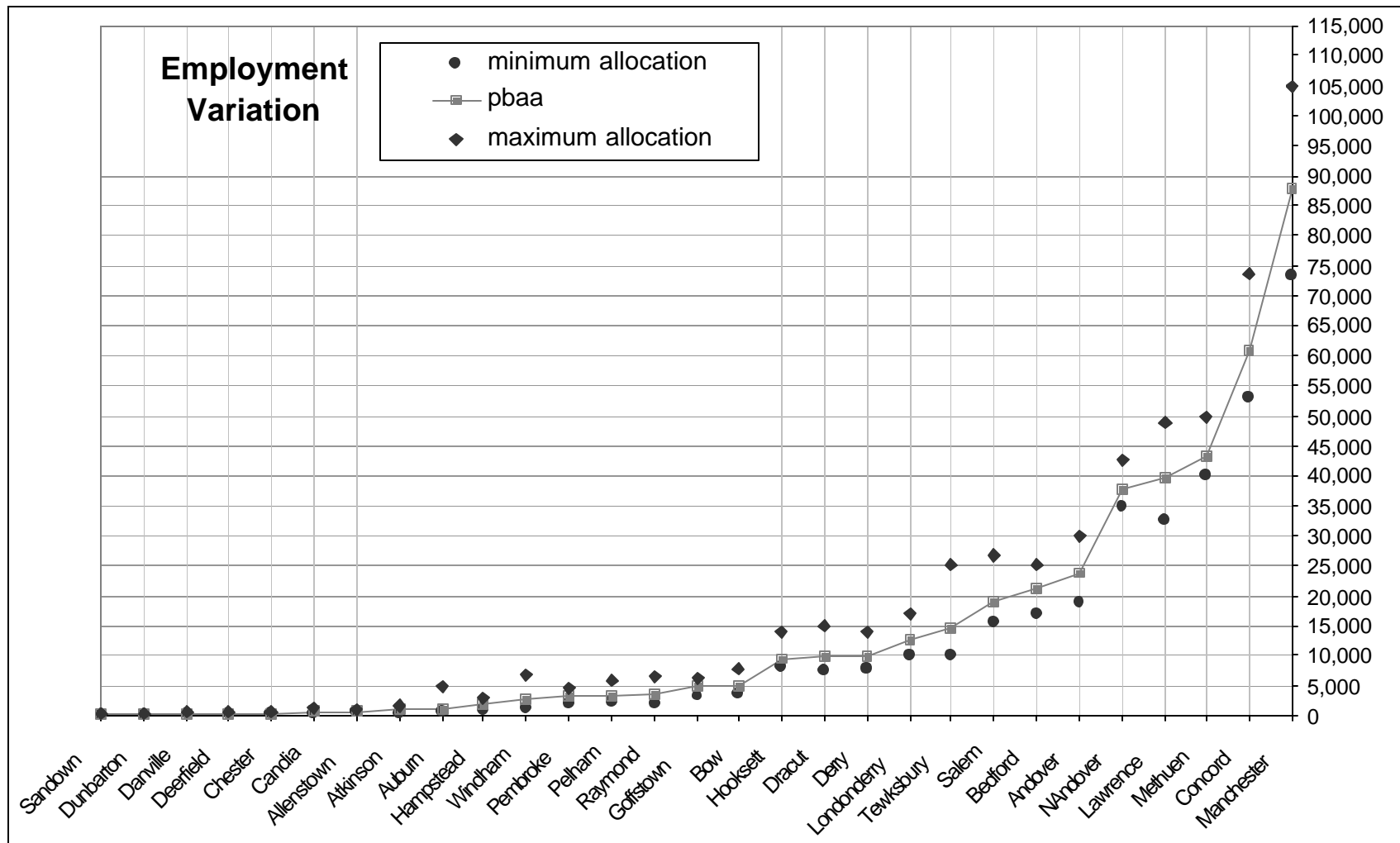
Table 5, below, shows the total allocations, by panelist, *for the New Hampshire* municipalities only. As in Table 4, totals are shown only for those panelists who carried out an allocation for each municipality.

Table 5: Total Allocations by Panelist, 2020 No-build and 2020 Build
New Hampshire Only

Panelist	2020 No Build Total Allocations	2020 Build Total Allocations	2020 No Build Total Allocations	2020 Build Total Allocations	Difference for Population	Difference for Employment
	population		employment			
1	454,800	462,980	229,100	235,280	8,180	6,180
2	483,000	483,000	266,600	266,600	0	0
3	556,100	574,300	260,400	276,620	18,200	16,220
4	473,436	508,064	270,640	289,452	34,628	18,812
5	442,350	486,650	208,435	236,135	44,300	27,700
6	485,000	530,000	229,100	243,850	45,000	14,750
7	481,200	521,600	220,200	236,700	40,400	16,500
8	---	508,500	---	247,400	---	---
9	479,000	499,200	243,900	255,120	20,200	11,220
11	469,000	480,850	228,260	236,160	11,850	7,900
12	469,900	603,000	---	---	133,100	---
13	466,600	527,200	247,050	285,700	60,600	38,650
14	459,000	476,900	214,100	229,000	17,900	14,900
min	442,350	462,980	208,435	229,000	0	0
max	556,100	603,000	270,640	289,452	133,100	38,650

An additional set of allocations for population are included (those of panelist #12) when we look at just the New Hampshire allocations. The inclusion of these allocations increases the change in total population (for New Hampshire places only). The change now ranges from 0 to over 133,000.

Population Variation

Legend:
- minimum allocation
- pbaa
- maximum allocation

Employment Variation

Legend:
- minimum allocation
- pbaa
- maximum allocation

Variation Graphs

The graphs shown on the previous two pages show the 2020 Build PBAA for each municipality, arrayed from smallest to largest. Also shown on the graph are the minimum and maximum allocation for each place. These graphs were constructed in order to investigate the relationship between the magnitude of the range (maximum allocation minus the minimum allocation) and the size of the PBAA. Looking at the graphs, it appears that there is a tendency for the range to increase as the allocation increases. Because this is somewhat difficult to make out, we also tested these relationships using a statistical software package to look at the correlation between the size of the PBAA and the size of the range. Although this is a small sample size, correlations indicate that there is a relatively strong correlation between the PBAA and the range. In other words, as the magnitude of the PBAA increases, so does the difference between the maximum and minimum allocations. However, the relationship for the employment numbers are stronger than for the population numbers. The correlation between the PBAA and range for population is equal to 0.67, while the correlation between the employment PBAA and its range is equal to 0.92.

Phase II Variation by Municipality

The table below shows the Minimum Allocation, PBAA, Maximum Allocation, Range, and Range % of each municipality.

Range *is equal to [Maximum – Minimum].* Range % *is equal to [Range ¸ PBAA]*

		Minimum Allocation	PBAA	Maximum Allocation	Range	Range %
1) Allenstown	Pop	5,330	6,472	8,400	3,070	47%
	Emp	500	711	1,100	600	84%
2) Andover	Pop	34,000	37,616	45,000	11,000	29%
	Emp	19,000	23,705	30,000	11,000	46%
3) Atkinson	Pop	7,000	9,757	11,300	4,300	44%
	Emp	475	875	1,700	1,225	140%
4) Auburn	Pop	6,100	8,865	12,200	6,100	69%
	Emp	500	1,047	5,000	4,500	430%
5) Bedford	Pop	21,000	27,186	31,658	10,658	39%
	Emp	17,000	21,300	25,000	8,000	38%
6) Bow	Pop	8,000	10,237	16,200	8,200	80%
	Emp	3,700	5,003	7,763	4,063	81%
7) Candia	Pop	4,660	6,425	7,900	3,240	50%
	Emp	300	601	1,200	900	150%
8) Chester	Pop	4,800	6,369	8,844	4,044	63%
	Emp	200	400	650	450	113%
9) Concord	Pop	45,000	50,997	63,800	18,800	37%
	Emp	53,140	61,052	73,700	20,560	34%
10) Danville	Pop	4,500	6,085	10,707	6,207	102%
	Emp	250	340	650	400	118%
11) Deerfield	Pop	4,550	5,989	9,000	4,450	74%
	Emp	200	383	620	420	110%
12) Derry	Pop	42,000	47,672	60,000	18,000	38%
	Emp	7,900	9,876	14,000	6,100	62%
13) Dracut	Pop	32,000	34,676	38,215	6,215	18%
	Emp	7,500	9,651	15,000	7,500	78%
14) Dunbarton	Pop	2,500	3,061	3,700	1,200	39%
	Emp	100	284	403	303	106%
15) Goffstown	Pop	20,900	23,328	30,700	9,800	42%
	Emp	3,300	4,913	6,300	3,000	61%

		Minimum Allocation	PBAA	Maximum Allocation	Range	Range %
16) Hampstead	Pop	10,970	13,970	18,900	7,930	57%
	Emp	1,100	2,041	3,000	1,900	93%
17) Hooksett	Pop	14,200	17,455	29,500	15,300	88%
	Emp	8,000	9,497	14,000	6,000	63%
18) Lawrence	Pop	75,410	81,429	93,744	18,334	23%
	Emp	32,430	39,583	49,000	16,570	42%
19) Londonderry	Pop	29,490	37,250	51,000	21,510	58%
	Emp	10,000	12,583	17,000	7,000	56%
20) Manchester	Pop	115,000	121,438	130,000	15,000	12%
	Emp	73,200	87,883	105,000	31,800	36%
21) Methuen	Pop	47,000	52,304	60,000	13,000	25%
	Emp	40,000	43,355	50,000	10,000	23%
22) N. Andover	Pop	28,000	32,856	40,400	12,400	38%
	Emp	35,000	37,644	42,800	7,800	21%
23) Pelham	Pop	13,860	18,911	26,300	12,440	66%
	Emp	2,300	3,165	6,000	3,700	117%
24) Pembroke	Pop	7,660	9,570	12,000	4,340	45%
	Emp	2,100	3,095	4,400	2,300	74%
25) Raymond	Pop	11,760	14,600	21,000	9,240	63%
	Emp	2,000	3,464	6,600	4,600	133%
26) Salem	Pop	32,400	39,587	53,200	20,800	53%
	Emp	15,750	19,008	26,800	11,050	58%
27) Sandown	Pop	6,050	8,174	12,800	6,750	83%
	Emp	100	251	403	303	121%
28) Tewksbury	Pop	32,190	35,100	40,000	7,810	22%
	Emp	9,990	14,696	25,160	15,170	103%
29) Windham	Pop	14,190	16,294	21,100	6,910	42%
	Emp	1,300	2,446	7,000	5,700	233%
TOTAL	**Pop**	**603,000**	**783,673**	**871,300**	**268,300**	**34%**
	Emp	**386,500**	**418,852**	**474,252**	**87,752**	**21%**

PHASE I (2020 NO-BUILD ALTERNATIVE) APPENDICES

This section of the Appendices contains a variety of materials highlighting the panel's Phase I work.

Phase I Panel Statements

This section contains the statements written by panelists in Rounds 1 and 2.

Panelist #1, Round 1 (no comment Round 2)

Allenstown

This small town is slightly off the beaten path. It is growing slowly but, on paper, looks far from prosperous. The most important point is that it is overwhelmingly made up of conservation/public lands. What land it does have is zoned substantially for commercial uses. I see little population growth but, increased job growth.

Andover

This town is close to build out, is increasingly affluent and will only expand its job base by higher density. Whereas it is a high tech center and square footage per worker is falling, I would expect this to happen. With falling birth rates, I think the population forecasts are too optimistic.

Atkinson

This town looks highly suburbanized. However, it is quite close to the centers of economic growth in Southern New Hampshire and the Merrimac Valley of Massachusetts. It is within easy commuting range of both I-93 and I-495. It also has a high median income. I would foresee greater population growth but, minimal job growth.

Auburn

This town looks like a suburb of Manchester. It has extensive water bodies and conservation areas and minimum land dedicated for commercial or industrial use. It is also highly affluent. This mixture of uses suggests higher residential growth and minimum job growth. I agree with the projections.

Bedford

This town could become an edge city between Manchester and Nashua. The improvements to Rte. 3 in Massachusetts will only help it to grow. It has minimal lands dedicated to commercial or industrial use and has high per capita income. I think it will grow faster than the projections because of the Rte. 3 improvements.

Bow

It looks like a suburb of Concord. It has a tremendously large amount of land zoned for industry and few constraints. With Concord growing South and Manchester coming North, Bow is well positioned. I predict greater industrial growth but, moderate population growth.

Candia

This small town has minimum land zoned for industry or retail activity. It is somewhat removed from the center of activity. However, it is likely to absorb residential growth from outward migration from Manchester due to Rte. 101. I see minimal economic growth and moderate residential growth. I agree with the estimates.

Chester

This looks like a rural town that is heavily forested. It has a good network of local roads. No lands are proposed for industrial/commercial use. I predict minimal change.

Concord

The City has room to grow, has good infrastructure, is the state capitol (and therefore, is recession proof), has a great highway net and a strong retail base. I predict that both population and jobs will increase faster than projections.

Danville

This is another rural town. It is at the fringe of the corridor, has extensive wetlands and no major road network. I think the population estimates are too high. I also see little economic growth.

Deerfield

A small out of the way community with no highway or real economic base. It will remain small.

Derry

It is well situated, has a cluster of employment between Rte. 28 and I-93, is attracting traffic, and is equal distance between Manchester and the I-495 high tech corridor. It is well placed for growth. I think the population and job projections are low.

Dracut

It looks like an overgrown mill town. If there is growth, it will come from an overspill from Lowell, Lawrence and I-495. I think it is close to "build-out." The estimates appear to be sound.

Dunbarton

A small rural town, off the beaten track. No locational advantage, no infrastructure and no reported industrial base. The predictions look accurate.

Goffstown

I don't know why employment dropped. It has some high slopes, some wet areas and a poor transportation network. It clearly does not want to grow rapidly. I see little change (assuming the empty facility will be revitalized).

Hampstead

I don't know why it is projected to expand its job base 500%! I need more data. Based on the material presented, it is far too optimistic. I also think the population is too high. The projections don't make sense.

Hooksett

Why the loss in employment? I think this town will grow rapidly even without a highway expansion. The estimates are too low.

Lawrence

This City is a sleeper! Watch out: As other towns refuse to expand their industrial base, Lawrence will provide new opportunities. Also, as one of the cities with a young population, we expect it will be a candidate to attract further growth. The estimates are "spot on."

Londonderry

A potential boomtown! Extensive lands zoned for economic uses, good highways, well located. This could be a much larger generator of jobs. Jobs will expand faster than people.

Manchester

A great improvement over the last thirty years. I think the projections are nearly accurate.

Methuen

This City is close to build out. Therefore, population growth will be slow. However, jobs will increase somewhat faster because of its industrial parks and location.

North Andover

This town will only grow in the smallest of increments. There is very little room to grow and the citizens are antigrowth. The estimates are a bit high.

Pelham

I predict that it will be a large suburban town. There will be extensive residential growth with minimal industrial/commercial development. It appears to be a bit off of the "mainline."

Pembroke

With available land, good location, appropriate zoning and excellent highways, this town is prime for development. The estimates seem low.

Raymond

It is some distance from major centers, has only one highway, has only residential zoning and is heavily forested. It will grow slowly.

Salem

This town will grow. I predict that jobs will grow more rapidly than population due to its highway access and proximity to I-495.

Sandown

This small town will have some minor population growth, but no industrial growth. It is too isolated, too forested and too rural.

Tewksbury

With two interstates within its boundaries, it is likely to expand its employment base. There will also be increased residential pressures. I think the estimates are accurate.

Windham

This town looks like it wants to restrict growth. For this reason, I predict slow growth in jobs and population. The numbers appear to be accurate.

Panelist #2 Round 1 (no comment Round 2)

Population Forecast

According the to the Census 2000 results, New Hampshire's population grew 11.4 percent during the 1990's to 1,235,786, making it the fastest growing eastern state north of Delaware. The fastest growing communities in New Hampshire in the 1990's were the smallest - places like **Newfields**, which grew 74 percent, from 888 people to 1,551; and **Moultonborough**, which grew 52 percent from 2,956 to 4,484.

When looking at levels of population change, as requested for the I-93 analysis, the larger areas add more people than the smaller areas. In the study area **Manchester** grew by 16,000 people in the last twenty years, and **Concord** added almost 11,000 in the same time period. Most notable, however, is the growth in population in **Derry**, New Hampshire, which has grown from 18,875 in 1980 to 34,021 in 2000, nearly doubling in size.

For the entire 29-town study area, population has increased by 151,000 over the last twenty years. The study area grew slower than the overall State of New Hampshire from 1980-1990, but faster than the State from 1990 to 2000.

Methodology – Population

In order to derive the study area town forecast I assumed first that New Hampshire population would grow slower in the future than it has in the recent past. New Hampshire added 126,000 people from 1990 to 2000. I assumed for the forecast that New Hampshire would add an additional 220,000 people by the year 2020, (110,000 per decade), bringing the total State population to about 1,450,000 by the year 2020. Although the OSP forecast calls for 1,527,873 people in New Hampshire by 2020, and even though year 2000 Census count slightly exceeds the OSP forecast for the year 2000, I nonetheless feel the OSP forecast is a bit optimistic.

The I-93 study area towns were then assumed to absorb half of New Hampshire's projected population change. This appears reasonable, given that from 1990-2000, the I-93 study area grew by 65,000, while the State of New Hampshire grew by 126,000. The total I-93 study area, then, is projected to increase by 110,000 people (half of the State increase of 220,000).

The total 2020 I-93 study area population change was allocated back to each of the I-93 towns, based on each town's proportionate growth in the years 1990 to 2000. For instance, **Allenstown** grew by 194 people from 1990 to 2000, while the entire study area grew by 64,785 in the same time period. Allenstown's 2020 population growth therefore is equal to the share of growth from 1990 to 2000, times the total 2020 I-93 study area population change.

$$(194/64,785)* 110,000 = 300$$

Employment Forecast

New Hampshire is likely to continue to outperform the rest of New England, posting 1.5 percent annual job growth from 2000 to 2005, compared to the New England region's 1 percent and the nation's 1.2 percent employment growth in the same time period. This is really a continuation of trends seen in the last five years, when New Hampshire employment grew at 2.8 percent annual rate, compared to 2.1 percent in the New England

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region and 2.3 percent in the nation. New Hampshire's cost of living and quality of life advantages over the other states in the region will ensure better than average performance in the future, as has been the case in the past.

I was able to find historical data for New Hampshire at the town level for the years 1988/89, 1993 and 1999. The history comes from the New Hampshire Department of Employment Security, Economic and Labor Market Information Bureau, Profile of New Hampshire's Counties, Cities and Towns. The website URL for the most recent data is:

http://www.nhworks.state.nh.us/elmi/cparch.htm

Some of this ES-202 data for 1999 differs significantly from the data shown on worksheet 3. The ES-202 shows about 38,000 employees in **Concord**, as compared to the 45,000 worksheet 3 estimate. The ES-202 data shows 64,000 employees in **Manchester**, compared to 60,000 on worksheet 3.

I did not change the 'base year' data on worksheet 3. However, someone may want to check it with the estimates described above.

Methodology – Employment

Employment change estimates were made for the New Hampshire towns, using two methods. In the first method, I assumed that the 2020 employment change for each town would be 2.3 times as fast as the employment change over the period 1993 to 1999. For the second method, I assumed that the 2020 employment change for each New Hampshire town would equal 1.5 times the change over the last eleven years (1988/89 to 1999). Both of these estimates imply significant, but still slower growth in employment than has been seen in the recent past.

Where the two estimates differed significantly, I averaged the results. For instance, for the town of **Bedford**, one method produced a job change of 8,700, the other a change of 6,400. In that case the 2020 employment change for Bedford was assumed to be 7,000.

Since I could not find any history on the Massachusetts towns, employment in those towns is assumed to grow at the same rate as population. For instance the 2020 employment change for the town of **Andover** is equal to the percent change in population in Andover for the same time period.

A final reasonability check was done by examining the ratio of jobs to population in the years 2000 and 2020. For the study area the ratio of jobs to population was 49% in 2000, and 53% in 2020. This implies faster future job growth than population growth, and is consistent with the historical experience, and therefore judged reasonable.

Panelist #3 Round 1

I-93, between **Salem** and **Manchester** (South of Rt. 101) was constructed between 1961 and 1963. It was interesting to see the population growth, from 1960 –1970, within Towns such as:

Salem (118%);

Windham (128%);

Derry (68%); and

Londonderry (117%)

The rate of growth was unusually high within the time frame, which coincided with the construction of I-93. From 1960 to 1970, Rockingham County grew by 40.3% and the State by 21.5%. This trend continued from 1970-1980 with the exception of **Salem**, all other aforementioned Towns had unusual rates of growth:

Salem (20%);

Windham (88%);

Derry (61%); and

Londonderry (154%)

Typically, highways are designed for a 10 to 20 year design life. The highest rates of population growth were experience within the design life of I-93. As I-93 became more congested, the rate of growth slowed, although the rate of growth was still higher than the county and state (e.g. 37% and 24% respectively). Population growth is also being slowed by the availability of developable land and land use controls. Most of the land developed over the last ten years has had wetlands, steep slopes or both on it. With a few exceptions, the majority of Towns have updated master plans. As result, most Towns have developed growth management ordinances, wetland ordinances, impact fee ordinance and capital improvements programs. All have a tremendous impact on the rate of growth but cannot stop growth.

Population growth within the study area is also influenced by the travel time from the Mass. Border. Maps 2B, 10 and 11 in our booklet and supplemental information shows that Towns within 30 minutes of the Mass. boarder had significant origin and destination trips within the study area, especially Towns abutting I-93. Given this information, as well as, the other information provided, the population projections for year 2020 by OSP were pretty good. OSP projections were only off by 1.6%. With a few exceptions, I felt the population projections prepared by OSP were pretty reliable. My assumption is that OSP did not factor in an expansion of I-93 into their projections for year 2010 or 2020.

Employment growth within the study area is projected to grow at a rate of 1.87% per year from 1999 to 2020 under a no build condition. Based on the data, I think that the study area will continue to grow at the projected pace. The travel time within the study areas, under a no build condition, from the Mass. Border is 30 to 45 minutes, and from Boston, it's only an additional 30 minutes. Not every Town within the study area has water and sewer available, but most Towns immediately abutting I-93 have water and sewer available which adds to the community's developmental attractiveness. The rate of population growth within the study area eventually will add more workers to the labor pool.

Provided that NH tax structure remains as it is, I think the employment growth will continue to move forward at a steady pace. What could possible slow employment growth would be the continued deteriorating level of service on I-93 and its secondary impact on the local roads.

Panelist #3 Round 2

The original figures were skewed due to an error entering the allocations and have been revised.

Panelist #4, Round 1

Concord citizens see a widened I-93 as a large bore double barrel shotgun staring at the community. The Goody Clancy team thought that the I-93 widening from **Salem** to **Hooksett** might increase Concord's growth potential by 30-40% in the next 20 years!

We should all look at some nationally historical examples.

Clearly Boston is the economic nucleus of the region. Currently the study area lives and dies on high tech. Despite the current inventory correction in the tech sector, as soon as the economy returns to positive expansion, the housing boom will re-ignite. The widening of I-93 will put Routes 128 and 495 within one hour commute of **Hooksett** and **Concord** as well as the communities to the south. Looking out 20 years we might well want to consider a 90-minute commute as the norm. That should be our macro view.

Phase I considers the "no build" scenario. Keep in mind that most of the study area was in recession for the first 4-5 years of the decade. Thus the growth rates really reflect 5 years of growth, not 10. These rates are not likely to be sustainable over time, but even 2-3% annual growth compounded, yields much larger totals than NH OSP's estimates. Some suburban communities undoubtedly will enact growth control ordinances.

The major element for regional growth is the **Manchester** airport. The 800-1,300 developable acres in **Londonderry** will be the nucleus—"ground zero" for growth in southern NH for the next 10-15 years. This could create 9m-15m SF and 3,000-9,500 jobs in **Londonderry** alone. A new exit 4½ off 93 as well as airport access to 93 (in **Derry**?) would substantially increase the growth projections. With jobs comes demand for housing. Even in a no build scenario, southern NH and northern MA are going to explode. Build the transportation infrastructure and they will come. Keep in mind a town like **Hooksett** is less than 25% built out today.

Commuting times reflects a key element of growth potential. By 2020 a 30-60 minute commute in central NH will be the norm with an improved transportation network that will cover virtually all of southern NH (all of Hillsborough and Rockingham counties along with much of Merrimack and some of Stratford, Cheshire and Belknap). If congestion does not clog the network, growth will be significant.

Will NH be able to attract business growth? What tax structure will be in place? NH's smart, educated, homogenous work force will attract businesses. The urban stresses of MA will push people north. The growth will exceed NH OSP projections even in a no build scenario.

Panelist #4, Round 2

My entries for Round One were overstated due to an error on my part. Regardless, I continue to be more bullish on area growth projections than the other panelists. Despite the current weak economic picture, I believe that sustained growth for the region for the next 20 years is very likely.

I spent the past month studying land use and topographic maps for the study area. Communities like **Hooksett** will explode in both population and job growth. Smaller communities will have large percentage increases due to work at home occupation, i.e., independent consultants and contractors to high tech industries. The I-93 widening likely will not increase the growth projections so much as accelerate them.

Panelist #5, Round 1

Employment

With an expected increase of 16,000 employees between now and 2020, **Manchester** has the greatest increase in employment in the employment estimates I have prepared. I believe that Manchester will continue to grow, but not to the level expected in the State of New Hampshire's traffic model projections. With a continued revitalization effort, an abundance of underutilized mill space, strong transportation facilities including the Manchester Airport, and other positive aspects related to a population base in excess of 100,000, I believe that Manchester will continue to be a strong draw, especially for new office related development.

Due to **Bedford** and **Londonderry's** close proximity to the **Manchester** Airport, as well as for many of the reasons mentioned which will continue to foster growth in Manchester's employment base, I expect employment in Bedford to increase by 6,000 and Londonderry's by 4,000 through 2020.

I believe that the city of **Concord's** employment base will continue to grow for many of the same reasons (except for the lack of a major regional airport) as **Manchester's** will grow. As the seat of state government, Concord already has a draw that is unmatched in the state. I expect the employment base in Concord to increase by 14,000 to 59,000.

In Massachusetts, I believe that **Lawrence** will attract employers over the next 20 years that are looking for more economical rents in an urbanized area while enjoying easy access to the interstates and Boston to the south. I estimate that the employment base in Lawrence will increase by 10,000 to 41,000. To the southeast, I project that **Tewksbury's** employment will increase to 15,000 from 9,000 in 2020. Tewksbury's location with strong access to both I-93 and I-495 will continue to foster employment growth.

Regarding the remainder of the Massachusetts communities in the study area, I project that **Andover**, **North Andover** and **Methuen** will each grow by 5,000 employees through 2020, with this growth generally driven by the easy access in those communities to both I-93 and I-495. I believe that the increase in **Dracut** (2,000 employees) will be lower due to the lack of direct interstate access.

The final four communities with a projected increase in employment in excess of 1,000 are **Salem** (2,000), **Hooksett** (2,000), **Goffstown** (1,500), and **Bow** (1,200). I believe that Salem will see a decline in the rate of retail growth from that experienced by the town through the 1990s, while I expect to see Hooksett see a corresponding increase in its retail base as big box infill development occurs along the I-93 corridor. While less so than **Bedford**, Goffstown should grow due to its close proximity to **Manchester**. In Bow, the area along Route 3A between Hooksett and **Concord** is seen by the Town as the location of more dense, high quality commercial development in the future.

I project employment growth in each of the remaining study area communities to be below 1,000 through 2020 for a variety of reasons ranging from the lack of direct interstate access to the overall rural nature of that community.

Population

Beginning with the Massachusetts communities within the study area, I believe that **Lawrence** (14,000) will experience the greatest overall growth in population through 2020 due to the increase in employment in the city and other reasons as described above. I expect that **Andover**, **Methuen**, **Tewksbury**, **Dracut** and **North Andover** will all experience a moderate level of population growth (ranging from 8,000 down to 4,000 new residents) over the 20-year period. All are within relatively close commuting distance of Boston and the I-93/I-495 corridors.

Communities in New Hampshire that I believe will experience strong growth include **Manchester**, **Bedford** and **Londonderry** with overall increases of 18,000, 8,000 and 8,000 residents, respectively. With increases in employment tied to the continued development of the Manchester Airport as well as other reasons described above, these communities should experience a fairly strong rate of growth. In comparison, I only expect **Goffstown** to grow by 3,500 persons over the same period because of the Town's location lack of direct interstate access and lower expected increases in employment.

Other New Hampshire communities that I expect to experience strong increases in population include **Salem**, **Pelham**, and **Derry**. These communities are situated in the midst of a corridor that allows a relatively easy commute to both the I-495 corridor as well as **Concord** and its environs to the north. In addition, I expect **Windham** to grow by 2,500 persons, from 11,000 to 13,500 because of its access to I-93.

I believe that **Auburn**, **Candia** and **Raymond** will benefit from the completion of the NH 101 improvements to the seacoast in addition to the easy access to **Manchester**. While I do not believe that the overall increase in population will exceed 2,000 people over the 20-year period in each of the three communities, this is a significant increase nonetheless.

To the north, I believe that the communities of Boscawen, **Concord**, Canterbury and Loudon would experience fairly strong growth over the 20-year period in a no-build condition. Concord itself recently surpassed 40,000 residents, and will likely continue to grow albeit at a lower rate than experienced in the 1990s. Boscawen, Canterbury and Loudon still have ample areas for future subdivision activity.

Bow and **Pembroke** continue to be destinations for those who are employed between **Concord** and **Manchester**. I expect both communities to grow by another 2,500 persons in 2020.

Regarding those outlying communities to the east of **Manchester**, I believe that **Hampstead** will at the greatest rate to 11,500 from 8,000. I believe its proximity to **Derry** will make it the next logical residential choice in future years. I believe **Sandown** and **Atkinson** will also experience increases in population, but not at the same rate as **Hampstead**. Finally, I believe that **Danville** will grow at a lesser overall rate (approximately 12% over the 20 year period) to 4,500 in 2020. These estimates are based upon proximity and accessibility to major transportation corridors and the number of major employers in the communities.

To the northeast of **Manchester**, I expect **Hooksett** to grow to approximately 15,000 from 12,000 and **Allenstown** to grow at a lesser rate to 5,500.

I believe that **Hooksett** will continue to be a less expensive alternative for those looking for housing in the Manchester vicinity through 2020, while the demand in **Allenstown** will probably not occur until after that time, if at all, due to its location without easy access to I-93 and the fact that much of the community's land area consists of state-owned lands.

Finally, other towns with expected growth of 500 persons include **Dunbarton**, **Chester**, and **Deerfield**. I do not expect the rural nature of these communities to change dramatically between now and 2020.

Panelist #5, Round 2

The rationales for the changes are as follows:

Atkinson

I believe that the Rt. 111 improvements will increase the rate of population and employment growth in Atkinson.

Bedford

I think I underestimated the influence of the growth of Manchester Airport on Bedford's employment base in 2020.

Derry

I concur with panelist 7 that Derry's population growth will be driven by higher density housing, so I increased the 2020 estimated population figure from 39,000 to 43,000. The increase in population should also result in higher employment growth in Derry.

Manchester

I believe I again underestimated the impact of the airport on employment growth. I increased the projected 2020 employment in Manchester from 76,000 to 80,000.

Raymond

Improvements to Rt 101should result in higher increases in Raymond's population and employment in 2020.

Panelist #6, Round 1

Population

I start with the assumption that population growth within towns is a dynamic function, making it very hard to predict. Some New Hampshire towns that grew rapidly in 1980-2000 period may now be "built out" and see much slower growth, or their growth rates could accelerate as they urbanize and become employment centers. The very features that drew people to a town in the '90s—good schools, pretty views, low taxes—may have been destroyed by rapid growth: it may take a decade for a town's infrastructure to catch up to the point where it can support new growth. A decline in a community's natural infrastructure and quality of life may leave it with slower growth (because it has become less desirable) or faster growth (because the declining property values make it a magnet for those looking for less expensive places to live). Moreover, land-use decisions in one town may have a profound impact on neighboring towns.

The kind of data that can be presented in a set of maps and tables like those included in the briefing book are inadequate to support a nuanced analysis of where growth will occur. And even thoughtful analyses—such as the OSP population projections from the mid-90s—are prone to significant error, as the 2000 Census has shown.

Rather than guess at the relative growth potential of each of the towns in the area, I decided to take a more straightforward approach and base my projections on the actual growth rates seen by each community between 1990 and 2000.

For the **New Hampshire towns**: I used the percentage change in population for each town between 1990 and 2000 as determined by the US Census. Towns in the area had very different growth rates, ranging from 4 percent to 59 percent over the 10 years. I assumed that the relative rates of growth would continue for the next 20 years—though probably at a somewhat lower rate. So, rather than assume that the slowest-growing town (**Allenstown**) would see 4 percent growth in each of the two decades (or about 8 percent for the period), I projected a 6 percent increase for the period. Similarly, for **Danville**, the fastest growing town in the group in the 1990s, I reduced the straight-line projection from 118 percent to 88.5 percent.

A more intellectually honest approach would be to submit a range of possibilities for each town. If your spreadsheet permitted, I would assume that growth in the communities under the no-build conditions would increase somewhere between half the rate of the 90s and twice the rate of the 90s. I hope that the outcome of the Delphi process will be a range rather than a single point for each municipality.

For the **Massachusetts towns** in the study area, the consultants have not provided the basic Census data that would allow a comparable calculation, so I used the projected population increase for 2000-2010 (table 2a) as the basis for determining a growth rate, then multiplied that by 1.5 for the total growth over the two decades.

Employment

I have not found any data in the briefing book sufficiently persuasive to use as a foundation for employment projections and I am hoping that the first-round responses will give me more to work with. I am particularly interested in hearing ideas on the potential for employment centers to grow in communities from Salem to Concord, and possibly displacing the commute to the Route 128 vicinity as one of the prime drivers of traffic on I-93.

Panelist #6, Round 2

I found all of the population and employment projections thoughtful and plausible—including those of panelists 3 and 4 projecting markedly greater growth than most of the others.

It strikes me that the high degree of agreement among the projections attests to our shared assumptions that the next 20 years will be pretty much like the last 20 years. That near unanimity—and conservatism—made me nervous. Any number of factors could make development patterns over the next 20 years very different from what we've seen, so I decided to work one of those factors into my projections: the very recent revolution in information technologies. We are just beginning to see the impact of that revolution in how and where people work. It seems likely to me that as fewer people are required to be at a central office every day, more people will choose to live in relatively more rural settings and then drive further (and longer) on those occasions when they do go into the office. With that in mind, I increased my growth estimates for those communities north of **Manchester** and further east or west of I-93.

(I had previously assumed that over the next 20 years each of the towns would grow by 1.5 times their actual growth in the '90s. In my revised estimate, I assume that the following towns would grow 2 times their growth in the '90s: **Allenstown**, **Atkinson**, **Candia**, **Concord**, and **Hooksett**. And the following towns would add 2.25 times as many people as they did in the '90s: **Auburn**, **Bow**, **Chester**, **Danville**, **Deerfield**, **Dunbarton**, **Hampstead**, and **Sandown**.)

I strongly agree with my colleagues who noted that the study area is unrealistically small: it should certainly reach north toward **Laconia**, west toward **New London**, and east toward **Exeter**.

In my first-round response, I noted that I hoped that my colleagues on the panel would provide useful insights into how employment levels might change over the next two decades. They did just that. I found panelist 10's analysis particularly compelling so I used his or her estimates as my starting point. In keeping with my assumption that more jobs will become home-based over the next 20 years, I then multiplied the base numbers for my list of mid-growth towns by 1.10 percent, and my higher-growth towns by 1.25 percent.

Panelist #7, Round 1

Overall Methodology

First, I completed the 1st and 2nd worksheets provided in the handbook. Once these were done, I copied several of the most significant columns in to a separate spreadsheet. For example, in the first exercise I determined that the most significant growth factors were water/sewer, growth zoning and housing costs. Specifically:

Water/sewer: Though the presence of a water and sewer system allow for a more compressed build out of an area, they may also delay the process as these infrastructure items require expansion, etc. A standard well/septic design, while lowering the density of the overall construction, allows new units to be built as fast as the developers and the economy allows.

Zoning: Provided the municipality has a substantial amount of developable land, the pace of growth will be determined by other, external factors rather than zoning. The zoning will determine cost, type and density of the development. In some cases, low density zoning actually results in a higher growth rate than higher density zoning due to the increased desirability of these areas as "bedroom communities".

Housing Costs: Again, often times the result is the inverse of the expected. Throughout the economic boom of the 90's, the fastest growing communities were often the most expensive as they were also the most desirable places to live. Hence, the effect of housing costs on municipalities' growth is actually a dichotomy. The most expensive and least expensive areas will grow the fastest. The most expensive because of two reasons; 1) that is where the upper/middle and upper class people want to live and 2) developers seek to build in these areas since their developments generate the highest selling prices. The least expensive areas also grow quickly due to two factors. First, due in large part to immigration and the aging of our population, the "low income" class is the fastest growing segment of our country. Second, it is in these less expensive areas that the government provides financial incentives for the developers to build industry and housing.

I next included for each municipality the growth rating for population and employment. I utilized the ratings you provided in the handbook; No, Slow, Moderate, Strong. Once these subjective ratings were completed, I entered columns for population data from 1980, 1990, and 2000. I calculated the growth rate for each decade and utilized this in determining the population and employment data for the target year of 2020.

Lastly, I scanned each municipality and sought out extenuating circumstances that will effect the progression of population and employment growth over the next 20 years. For example, regardless of what takes place with I-93, the NH DOT will soon rebuild and expand a section of Route 111. This project will have a significant impact on **Atkinson**, **Hampstead**, etc.

Below I have listed each municipality and any brief comments that may help to explain my determinations.

Allenstown

With almost 70% of their land in conservation, and no industry to speak of, Allenstown will experience very limited growth in both population and employment.

Andover

Due to its proximity to Boston and its existing base of high technology employers, Andover will continue to gain employment at a strong pace over the next 20 years. However, its population will begin to stabilize as land becomes scarce and developers move to more favorable locations, such as North Andover.

Atkinson

The reconstruction of Route 111 will have a significant impact as it makes Atkinson much more accessible to I-93 and hence, brings it within commuting distance to Andover, Burlington and Boston.

Auburn

Proximity to I-93 and Route 28 will continue to generate a strong growth rate in Auburn. Also a significant factor is the availability of large, undeveloped parcels of land.

Bedford

As Manchester continues to grow, so will Bedford. This applies to both population and employment. Large tracts of land still exist for residential, commercial and industrial development.

Bow

This municipality will continue to serve as an up scale bedroom community for Concord. Growth will be moderate to strong in percentages, yet small in numbers. Little commercial or industrial growth will take place as these developers seek more favorable locations.

Candia/Chester

These two municipalities will continue moderate to strong growth due to their favorable, undeveloped land areas and their proximity to I-93 and Route 101. In neither case will employment grow significantly as these communities continue their service as bedroom communities rahter than employment destinations.

Concord

Though large in numbers, the growth in this city should be small as a percentage. Major employers will seek alternative sites; either closer to Manchester airport or more rural, less expensive locations north. Housing will grow mainly as a result of high density, lower income dwellings.

Danville/Deerfield

Moderate population and low employment growth for each. Each is too far from I-93 or Route 101 to experience any significant growth.

Derry

Due in large part to the continued build out of medium and high density dwellings, Derry will continue a strong pace of population growth, albeit at a slower pace than historical. Commercial/retail development will continue to drive their employment throughout the next 20 years.

Dracut

Existing densities, taxes and proximity to New Hampshire will all play a role in limiting Dracut's growth in both areas throughout the next two decades.

Dumbarton

Moderate population growth is mostly the result of the existing population being so low. Small numbers allow for high percentages.

Goffstown

The population growth of Manchester will continue to push west in to Goffstown, resulting in significant growth rates for this municipality. Employment will remain slow as a limited land supply (due to conservation) pushes commercial development to Bedford, Manchester and Hookset.

Hampstead

Similar to Atkinson, this community will feel the effects of a rebuilt Route 111 in the very near future.

Hookset

Similar to Goffstown, Manchester will continue to push northeast into the Hookset area. This will result in moderate growth in both employment and population.

Lawrence

Due mostly to immigration, Lawrence will continue to grow at a moderate pace. However, this will also limit the growth of employment as the city becomes undesirable for major commercial development.

Londonderry

Large tracts of developable land, both residential and commercial when combined with its proximity to Manchester, Derry and I-93 mark Londonderry for significant growth throughout 2020.

Manchester

Current infrastructure projects such as the airport improvements and the new arena should allow Manchester to grow at a moderate to strong rate in both population and employment. Some of this growth will come in large blocks as developers seek to build large residential and commercial projects.

Methuen

As Boston continues to push north, Methuen will continue to grow at a moderate to strong pace.

North Andover

As Andover is reaching maximum density in its residential areas, developers and residents are looking to the east for new opportunities. Look for population to grow at a strong rate throughout the next 20 years.

Pelham

Proximity to I-93, Boston and a low tax burden will allow Pelham to continue to grow at a moderate to strong rate. Especially if I-93 is not expanded. This scenario makes Pelham even more attractive to developers and residents.

Pembroke

It's location between Manchester and Concord, when combined, will enable Pembroke to grow at a moderate rate. However, other towns further south will have to become much more expensive and built out before developers look this far north.

Raymond

Too far east, too far north. Little or no employment growth and slow population growth.

Salem

The introduction of multiple, high density residential dwellings will drive Salem's population growth throughout the next 20 years while its large commercial/retail base will drive the growth in employment. It's proximity to major highways and Boston are already secured.

Sandown

Too far from I-93 and/or Route 111 to experience any significant growth in either area.

Tewksbury

As one of the last remaining municipalities with developable land in this section of Mass., Tewksbury will experience increased growth rates in both population and employment. Significant infrastructure improvements, (i.e. schools) will help drive this development.

Windham

Barring the introduction of a public water or sewer system, Windham will achieve 98% of it's maximum build out by the year 2020. This is regardless of the reconstruction of Route 111 or I-93. This same factor will limit commercial/industrial development to a slow pace.

Panelist #7, Round 2

Simply put, several small towns were adjusted upwards in both employment and population. This was in response to several comments I read from some of the other participant who, it seemed, were more familiar with the nuances of these municipalities than I was.

Panelist #8, Round 1 (No comment Round 2)

Overall Methodology

I considered the models that were used to estimate population and employment. These models seem to be appropriate. I modified the population projections and employment projections when I had some additional insights or some patterns that might not have been reflected in the models. One of my primary assumptions is that job growth will slow. More people will want to live closer to work and gas prices will continue to increase. I also considered current economic development of the past will slow. The comments I had written on my draft work sheets are as follows:

Allenstown

Population increase due to normal growth and job expansion in Concord.

Andover

Stayed with Miser projection, see job growth remaining stable.

Atkinson

No other information to doubt OSP estimates. Don't see much job growth.

Auburn

OSP estimates are a little low considering continued population growth due to Manchester growth and availability of land.

Bedford

High density residential will continue to expand to support increased employment opportunities.

Bow

Population increase more of a conversion from low density housing to higher density housing primarily due to Concord job growth. New jobs to support the expanding residential areas.

Candia

Population increase due to 101 improvements, and Manchester growth jobs to provide services to support expanding population.

Chester

Experienced a 31% increase in housing units, this 102 already at capacity.

Concord

See more high density residential (active planning collaboration with others in region will lead to more residential development). NH growth in government is unstable as a result of tax uncertainty.

Danville

Caught Manchester and seacoast – no reason to doubt given estimates 100 new jobs due primarily to population growth.

Deerfield

Population growth will occur in Route 4 corridor– no reason to doubt given OSP estimates. Do not see much change in employment. No change in job status

Derry

Higher density residential development will continue to happen. Some job growth to support this development.

Dracut

No reason to doubt Miser estimates. Don't see job situation changing dramatically.

Dunbarton

Some population growth due to Concord and Manchester job growth.

Goffstown

See alternative types of housing developments and new jobs. No reason to question OSP estimates.

Hampstead

No reason to doubt population estimates or job estimates

Hooksett

It will continue to grow, particularly with the growth in jobs in Concord and Manchester.

Lawrence

Expect population growth to remain stable. Did not question available estimates.

Londonderry

Likely be some expansion associated with Derry's growth, see some employment expansion.

Manchester

Airport and other economic activities will continue to fuel population and job growth.

Methuen

See some expansion in 495 corridor in high density housing, close to services.

North Andover

Some growth in jobs with people wanting to work close to home. See some new economic activities due to changing labor demands.

Pelham

Retail will likely expand. Residential growth will expand faster than jobs.

Pembroke

Concord growth will be distributed around the region.

Raymond

Route 101 impacts will likely impact projections.

Salem

Gambling could expand and would mean jobs.

Sandown

No reason to doubt population projections.

Tewksbury

No reason to doubt estimates.

Windham

Will continue to grow due to Salem expansion. Retail expansion may change depending on what happens with the tax situation.

Panelist #9, Round 1 (No comment Round 2)

I have tackled population change only, since I have no background in estimating employment for the communities in the interest area. Also, since I have no familiarity with change dynamics in the Massachusetts communities, I have marked them "NA" in the spreadsheet. My approach in allocating 2020 population to the NH municipalities is based on the following criteria and judgments:

I developed a map of 1990 Census block and tracts by population density to get an idea of the relative density across the study area. Density will have changed according to the 2000 census data, but that is not currently available to me. Consequently, I have "factored up" the patterns by community according to the actual population gain I see in the 2000 Census data.

I developed another map showing the percent difference between NHOSP's projected 2000 population and the actual population as documented by the Census. There are significant differences (greater than projected growth) in **Bedford** and **Manchester**, and notable differences in **Bow**, **Dunbarton**, **Chester**, and **Danville**. It is also important to note that less-than-projected growth occurred in the "urbanizing corridor" towns in the south, such as **Pelham**, **Salem**, **Atkinson**, **Derry**, and **Auburn**.

I reviewed and mapped the gains in housing stock for all towns by percent 1990 to 1998. Not surprisingly, there is a strong correlation between towns showing significant population gains (over the NHOSP estimates) and higher percentage gains in housing.

I overlaid conservation and public lands on the maps, as well as the primary highway system. Some towns, such as **Dunbarton** and **Deerfield** have a substantial array of protected lands, making them particularly attractive for those seeking a rural residential lifestyle, and therefore susceptible to more development pressure. **Allenstown** is dominated by the Bear Brook State Park, and thus probably does not have much development potential. The road system appears to be a factor in higher growth rates in **Bedford** and **Chester** for sure, and probably **Danville** and **Dunbarton**.

Based on this mix of data and patternseeking, I assigned a Slow/Moderate/Strong growth rating to the NH communities.

Then I used a weighted approach to assigning population gain in 2020, as follow: Slow = NHOSP projection, ie, steady/flat growth; Moderate = NHOSP plus 10%, based on what can be seen in the middle-ground towns with higher-than-projected NHOSP population gains in 2000; and, Strong = NHOSP plus 20% consistent with the top-ranked towns with higher-than-projected population gains.

My instinct is that **Dunbarton's** estimated growth of only 300 persons is very probably too low, and needs to be factored up substantially. The same is probably true of **Deerfield**. Both towns have a very attractive rural character, low density, and will be prime targets of "leap-frogging" development, particularly for single-family detached housing which dominates homebuilding in NH. In obverse, it is also clear that the southern corridor towns, as noted above, have spent their rural character attractiveness capital, and will not be as likely to see development

Panelist #10, Round 1

My major assumptions relative to these forecasts are as follows:

Employment growth will largely occur in those municipalities with sewer and water and with reasonable highway access. This is primarily those areas which already have municipal utilities because there has been limited new public sector investment into municipal sewer/water and soil conditions, coupled with local zoning, do not allow intensive new development without essential utilities.

The absolute amount of employment growth is not likely to be that different between the build and no-build scenario in the secondary impact area as defined. The build-out scenario is likely to accelerate the rate of development, but the end result may not be that much different. However, the build-out scenario is likely to help accelerate the amount of development in the **Concord/Bow** area and will eventually help extend the growth corridor up to the **Tilton/Franklin/Plymouth** area, whereas the no-build scenario is likely to intensify development pressure in communities south of **Manchester**.

I-93 serves not only daily commuters and regional businesses, but also tourists. How much does tourism add to the traffic counts, particularly on the weekends? I think the commuter information survey data cited in the material provided us is very limited, and dated (1994) for a project of this magnitude.

In my opinion, the secondary impact area is <u>much</u> broader than you have defined and includes the **North County**, the **Lakes Region** and the **Dartmouth/Sunapee Region**. The tourist industry in each of these regions is heavily dependent on I-93 and if the congestion and traffic delays continue to get worse, tourism in these regions of the State will suffer. By not acknowledging these regions of NH as part of the secondary impact area, a major economic development/secondary impact issue is not being addressed as part of this analysis. Several years ago Maine went through a similar process in deciding to widen the Maine Turnpike and through a series of extensive business surveys, documented the connection between I-95 in York County and the tourism economy further north. It might be worthwhile to review this research.

The secondary impact area also includes communities such as **Merrimack**, NH and towns along I-89 such as **Warner** and **Hopkinton**.

Population growth will tend to follow employment growth more closely than the forecasts in the briefing package which are summarized below. The population growth will also tend to be more dispersed than the employment growth, and will occur in the more outlying communities such as **Warner**.

% Change 2000- 2020		
	Employ	Pop
New Hampshire	52%	25%
Massachusetts	22%	13%
Source: Parsons Brinckerhoff Briefing Book, June 2001		

Panelist #10, Round 2

I have reviewed the material you sent and have no changes to my forecasts, however I continue to strongly disagree with the definition of the secondary impact area.

Panelist #11, Round 1

In thinking about the factors that affect growth, I offer the following observations. Land will eventually be used for the best and highest use permitted by local zoning regulations. When this occurs, for any given parcel, will depend on several factors. The overall economic conditions, the relative location of the parcel within the community, the relative location of the community to areas of employment, property taxes, quality of schools, availability of infrastructure, such as transportation, water, sewer and utilities.

The purpose of this study is to detect and quantify any impact on land use patterns and timeframes that may be attributable to the build or no-build scenarios for the I-93 widening between Salem and Manchester, NH. The impact on land use will be different for residential and non-residential uses. While a deficiency in transportation infrastructure may bee seen as an inhibitor to growth, it is a stronger inhibitor for employment growth than for population growth. The primary reasons for this difference are that businesses are more sensitive to transportation in their location choices than are residential purchasers. Each of us is concerned with the potential for traffic congestion and long commute hours, but as homeowners we are more strongly motivated by factors such as affordability of the home, property taxes, good schools, recreational opportunities, and the quality of life in the perspective community.

In considering the likely growth of each of the communities in the study area, all these factors were evaluated. In addition, communities were classified as mature or developing, with respect to their level of build-out.

Panelist #11, Round 2

The purpose of this study is to detect and quantify any impact on land use patterns and timeframes that may be attributable to the build or no-build scenarios for the I-93 widening between Salem and Manchester, NH. The impact on land use will be different for residential and non-residential uses. While a deficiency in transportation infrastructure may bee seen as an inhibitor to growth, it is a stronger inhibitor for employment growth than for population growth. The primary reasons for this difference are that businesses are more sensitive to transportation in their location choices than are residential purchasers. Each of us is concerned with the potential for traffic congestion and long commute hours, but as homeowners we are more strongly motivated by factors such as affordability of the home, property taxes, good schools, recreational opportunities, and the quality of life in the perspective community.

In considering the likely growth of each of the communities in the study area, all these factors were evaluated. In addition, communities were classified as mature or developing, with respect to their level of build-out. The following communities are in a mature stage of development, and will reach build-out by 2020: **Andover** (MA), **Bedford**, **Concord**, **Derry**, **Dracut** (MA), **Lawrence** (MA), **Londonderry**, **Manchester**, **Methuen** (MA), **North Andover** (MA), **Salem**, **Tewksbury** (MA), **Windham**. The following New Hampshire communities within the study area currently have a Growth management Ordinance in place: **Auburn**, **Bow**, **Danville**, **Derry**, **Londonderry**. **Chester** has proposed one recently.

Part of the methodology used for growth allocations is based in past growth performance, and especially in building permits issued. It should be theoretically possible to derive a build out population figure for any of the communities in question, given a sufficiently detailed knowledge of the land use regulations (e.g. zoning, subdivision and site plan regulations), in conjunction with an inventory of vacant parcels, and details of impediments to development such as slopes, soils, ledge, wetlands, and the like. This analysis has been conducted for my community as part of our Master Plan process. However, certain key facts are not available to the panel, and thus my allocations have been based more on a general knowledge of the communities, rather than a detailed build out analysis.

I would expect the following communities to experience slow to moderate growth, based on location, transportation, water and sewer infrastructure and land use policy: **Allenstown**, **Danville**, **Deerfield**, **Dunbarton**, **Pembroke**, **Raymond** and **Sandown**. The following communities will experience moderate to strong growth: **Andover** (MA), **Atkinson**, **Auburn**, **Candia**, **Chester**, **Hampstead**, **North Andover** (MA), **Pelham** and **Windham**. The following communities will experience strong growth: **Bedford**, **Bow**, **Concord**, **Derry**, **Dracut** (MA) **Goffstown**, **Hooksett**, **Londonderry**, and **Salem**. The following communities will experience moderate growth, as a percentage, but substantial growth in absolute terms, as mature communities experiencing in-fill growth: **Lawrence** (MA), **Manchester**, **Methuen** (MA), **Tewksbury** (MA).

In reviewing the comments of the panelists for Round 1 of Phase 1, I find the assessments of panelists 1, 2, 5, and 7 particularly compelling. I think that panelists 3 and 4 have substantially overstated the likely growth in the study area by 2020. My own allocations are on the low side, but not inconsistent with the mean, and I will allow them to stand for Round 2 of Phase 1.

Panelist #12 (Round 2 only)

Given that I-93 was completed in the early 1960's its impact on population and employment trends today is minimal. It certainly served as a catalyst for growth during the period of 1963 to 1985. Post 1985, until the economic slowdown of the late 1980's, the highway's influence lessened dramatically.

Growth thereafter became more or less conditioned upon the sophistication and/or improvement in land use controls implemented and enforced by New Hampshire Communities. The majority of new residents came from the south (Massachusetts) and were attracted to New Hampshire for a lot of reasons. Among those were affordability, ruralness, quiet, low taxes, ample recreational facilities, and simplicity.

Times have changed somewhat, in certain instances dramatically. The New Hampshire infrastructure both locally and regionally has not kept pace with the influx of new residents. Roads, schools, basic governmental services, local tax rates, police protection, etc. are no longer admirable in most communities. Taxes and schools (funding) are now at the forefront of influences regarding New Hampshire's future. Inherent problems are being incurred in most every community in the study area as a direct result of the rapid and sudden growth. Many of the factors which stimulated an influx of new residents are now gone, destroyed by the very same growth which they attracted.

Having had the past opportunity to assist and labor in each and every community of the study area over the past thirty years of my professional life, I firmly believe that their ability to deal with future growth issues has improved dramatically over the past thirty years. In certain communities, planning and land use control improvement came out of necessity as opposed to willingness, but non-the-less happened. Regardless, most communities continue to struggle with lay planning boards, and a lack of professional advice and assistance. All of which leads me to the point that growth will continue, but at a much reduced rate than the past has demonstrated. That will also be the case regardless of whether or not an improved Interstate 93 is constructed.

Certainly the impact of a new highway is different for residential and nonresidential users. The lack of an adequate transportation infrastructure in New Hampshire, has a somewhat negative impact on residential growth, but a much more profound effect negatively; on employment growth. The movement of goods and services from an employers point of view is much more important than to a residential homeowner.

Employment growth in the region is also very much influenced by the availability of an educated workforce. The needs of new industry are much different than those of the past. "Blue collar" laborers are not in demand any longer, more sophisticated high-tech firms need an employable, trainable individual who provides a level of

service beyond previous standards. New Hampshire has made significant strides to improve its responsiveness to these needs by localizing and upgrading the vocational technical college curriculum, but more needs to be done.

In summary, while an improved highway will have a positive influence on unexercised population growth, it will not do so to the extent of past experience. New Hampshire's aura and attractiveness has diminished tremendously over recent years. The same set of conditions that attracted the enormous growth of the past have been severely negatively impacted by that very same growth. Economic conditions, the lack of job opportunity to the north, and the access to communities outside the study area would be stronger influencing factors than those under consideration here.

Panelist #13 (Round 2 only)

In the aggregate, I am struck by the quality of the analysis and rationales on the panelists, and find review of their thinking helpful. At the same time, I find myself unable to estimate population or employment changes by municipality, because I believe that the forces that will shape the pattern of growth over the next 20 years in southern NH will be substantially different than those experienced in the 20th century. It is clear in reviewing the first round population and employment estimates for the no- build alternative, that all panelists assumed continuation in current trends. Based on my work with regional climate experts, I believe that three major new factors must be factored into analysis of projected population and employment changes:

1) increasing sea level and storm surges;

2) more severe weather;

3) a parallel evolution away from a primarily fossil fuel based economy.

At the same time, I expect that the current trend of population growth will continue in the region, and will most likely increase because of those three new factors. So, for me, the key question is not how much will the region grow in people and jobs, but rather how will the host communities absorb that growth?

Another major factor not incorporated into current analysis is that in more rural or less developed communities, the relative change in population is much more significant than the total number—i.e. those towns with infrastructure investment absorb growth differently than those earlier in the development continuum, who must face the decision of if, and when, to allow or require sewer and water, or to expand their planning capacity. Travel time is a major variable influencing the nature of that growth.

I therefore again ask that PB/NHDOT take advantage of the assembled knowledge and experience to tack on two "extra credit" questions for panel members:

how might the widening influence the location and type of jobs?

What specific tools or approaches could be used by local communities, regional entities, and state agencies to absorb any projected growth associated with the I93 widening with out losing the essential NH character that drives much of the economic vitality and quality of life in the region? (the "so what" question)
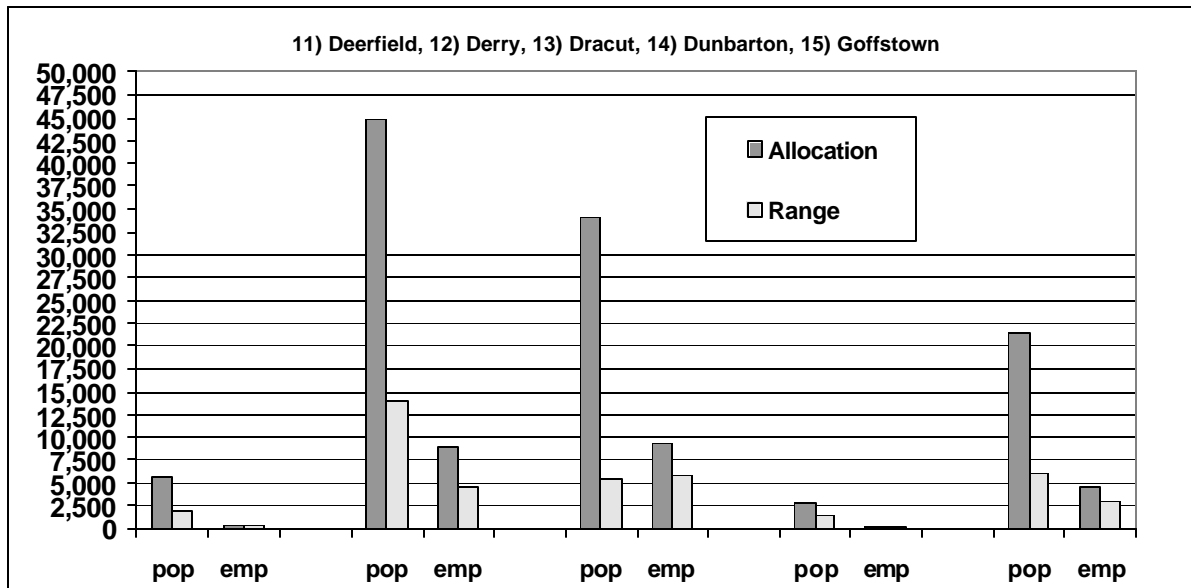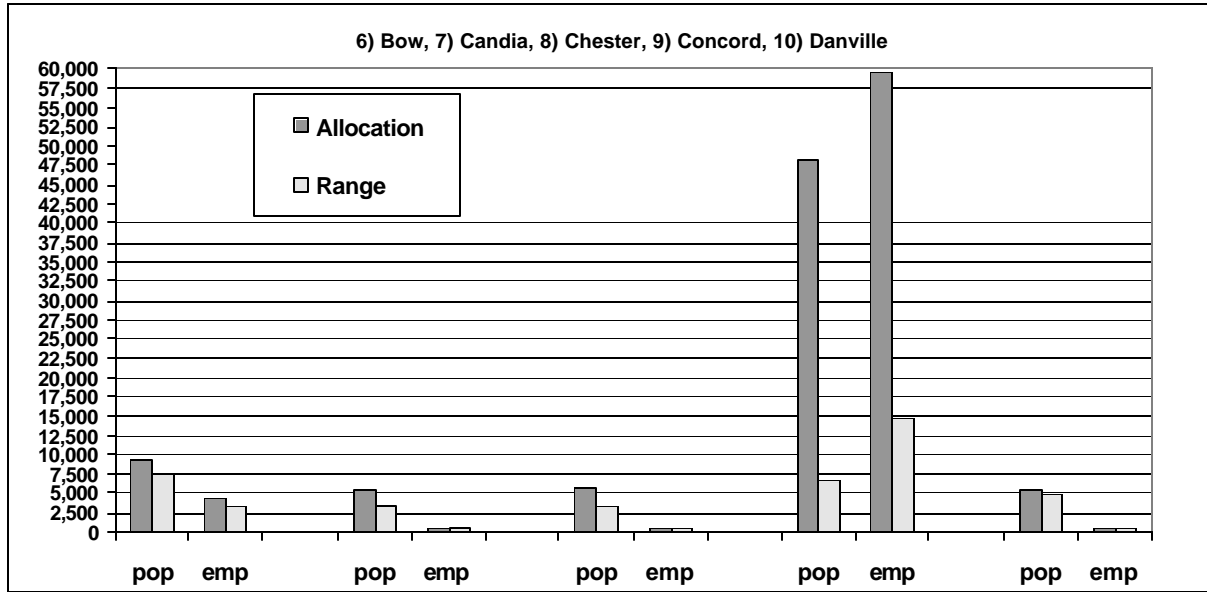
Answers to such questions may help inform the post-Delphi deliberations as NHDOT continues to innovate in this critical area of transportation planning.

# Phase I Panelists' Blended Average Allocation and Range Graphs

The following graphs show the 2020 No-Build PBAA and Range for each municipality, beginning with a total for the study area as a whole.. The derivation of the PBAA, which expresses a "blended average" of the panelists' allocations, is described in the next-to-last Appendix to this report. The Range, which equals the maximum allocation minus the minimum, is shown in order to provide a sense of the variation among panelist's allocations.
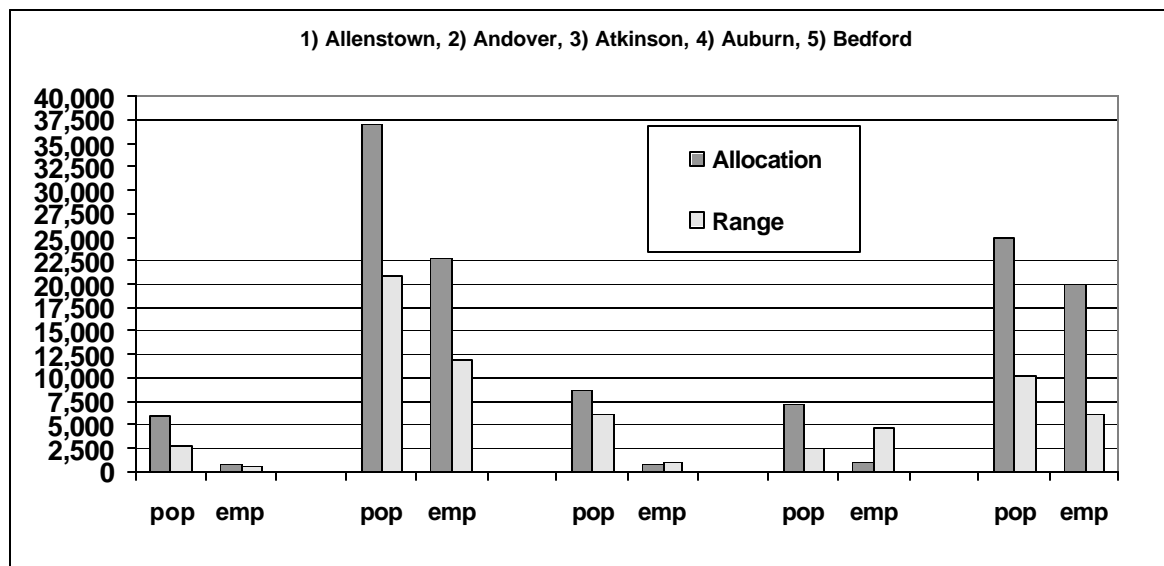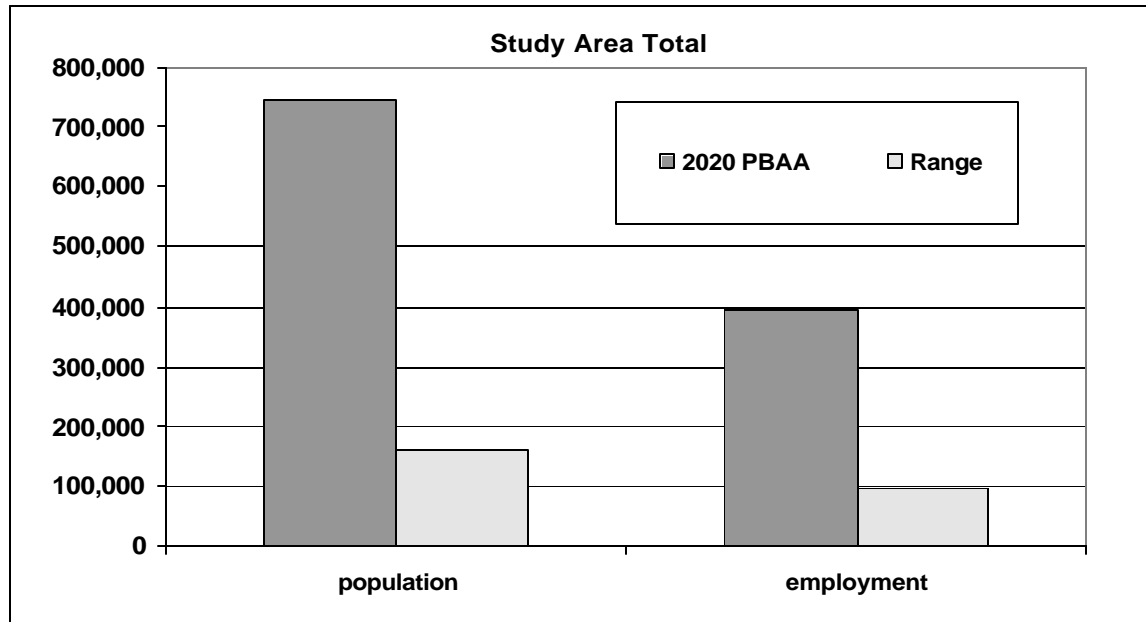
Study Area Total

1) Allenstown, 2) Andover, 3) Atkinson, 4) Auburn, 5) Bedford

Note: Population and employment pairs are graphed in the same order as the headings. "Allocation" refers to the PBAA..

6) Bow, 7) Candia, 8) Chester, 9) Concord, 10) Danville

11) Deerfield, 12) Derry, 13) Dracut, 14) Dunbarton, 15) Goffstown

Note: Population and employment pairs are graphed in the same order as the headings. "Allocation" refers to the PBAA..

6) Bow, 7) Candia, 8) Chester, 9) Concord, 10) Danville

16) Hampstead, 17) Hooksett, 18) Lawrence, 19) Londonderry, 20) Manchester

Note: Population and employment pairs are graphed in the same order as the headings. "Allocation" refers to the PBAA..

6) Bow, 7) Candia, 8) Chester, 9) Concord, 10) Danville

21) Methueun, 22) North Andover, 23) Pelham, 24) Pembroke, 25) Raymond

Note: Population and employment pairs are graphed in the same order as the headings. "Allocation" refers to the PBAA..

26) Salem, 27) Sandown, 28) Tewksbury, 29) Windham
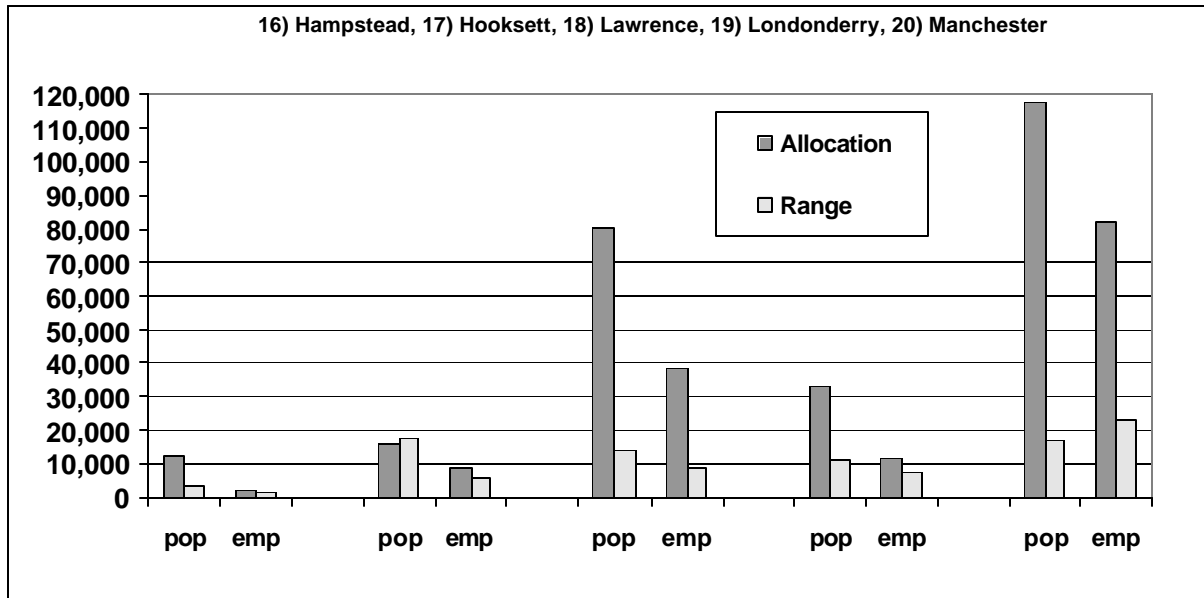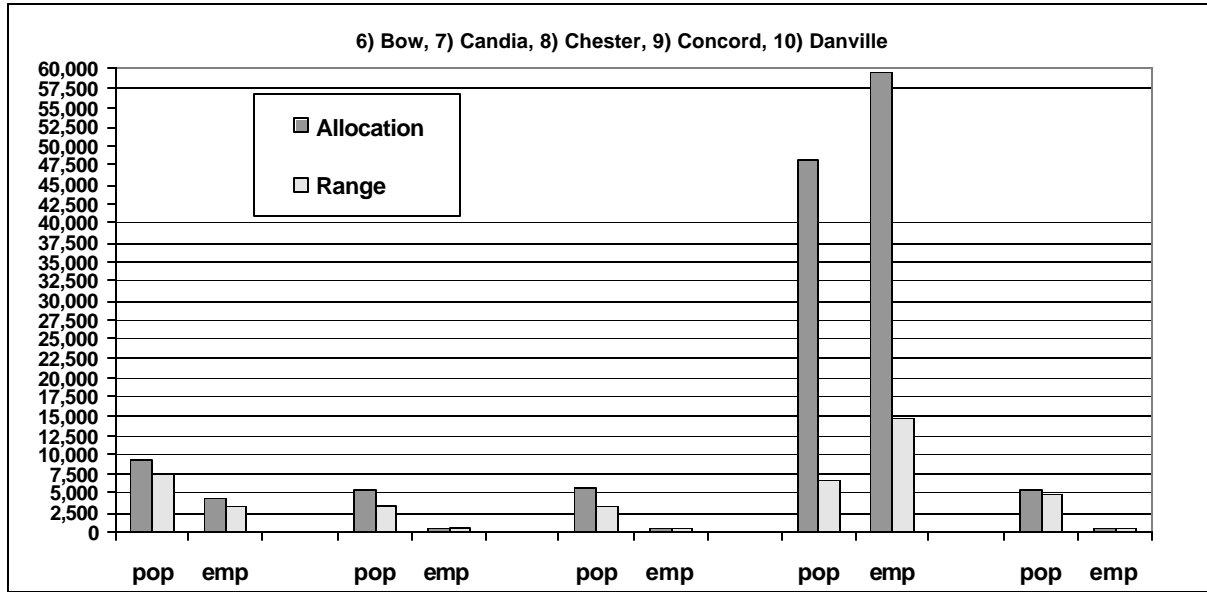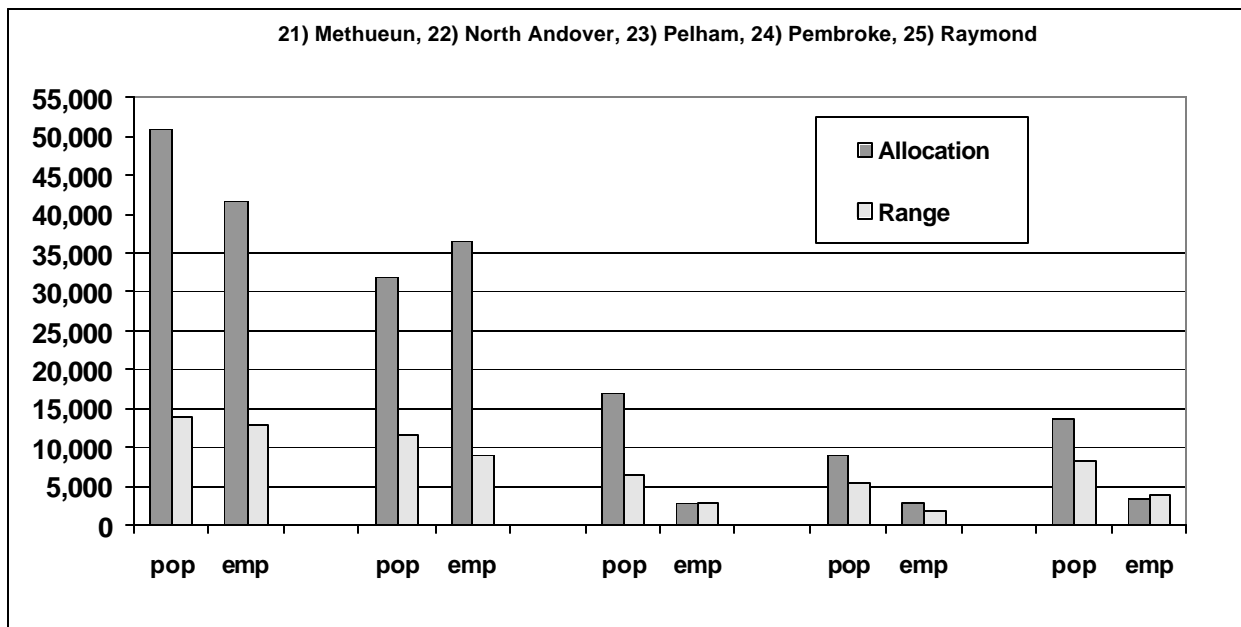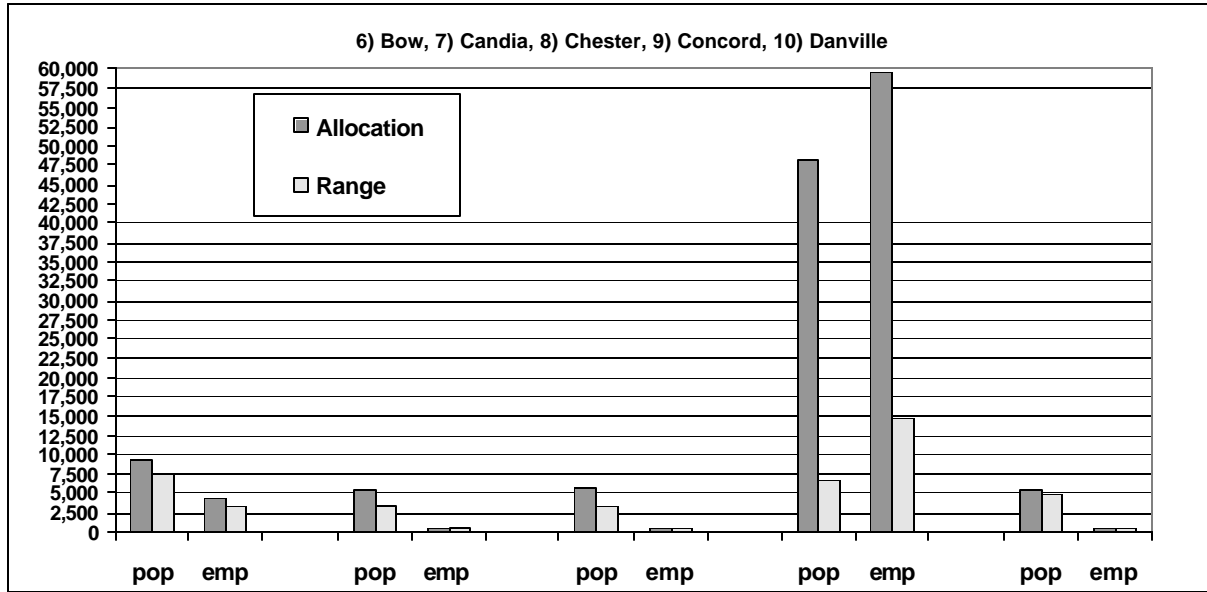
Note: Population and employment pairs are graphed in the same order as the headings. "Allocation" refers to the PBAA.

Phase I Statistics

The following tables show the statistics behind the PBAA and the Range. As described in last section in this report, the PBAA equals the Mean plus the Median, divided by two. The Range is equal to the Maximum minus the Minimum.

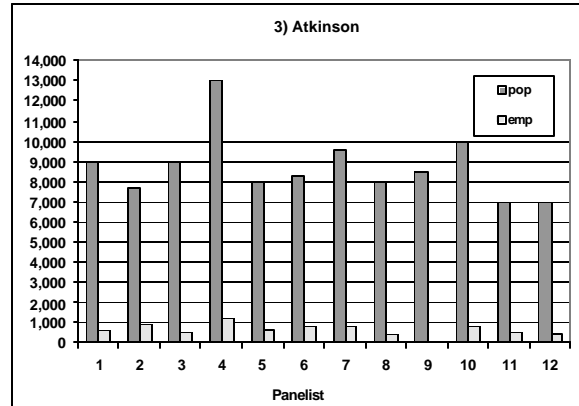|	1) Allenstown		2) Andover		3) Atkinson		4) Auburn		5) Bedford	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	6,042	620	37,998	22,436	8,757	697	7,266	1,051	24,813	19,864
Median	5,900	600	36,000	23,000	8,390	650	7,000	600	25,000	20,000
Minimum	5,300	400	34,000	18,000	7,000	400	6,000	400	20,000	16,000
Maximum	8,000	1,000	55,000	30,000	13,000	1,200	8,500	5,000	30,150	22,000
PBAA	5,971	610	36,999	22,718	8,573	673	7,133	825	24,906	19,932
Range	2,700	600	21,000	12,000	6,000	800	2,500	4,600	10,150	6,000

	6) Bow		7) Candia		8) Chester		9) Concord		10) Danville	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	9,477	4,677	5,517	498	5,570	346	48,505	59,218	5,718	337
Median	9,050	4,000	5,300	400	5,675	300	48,000	60,000	5,450	300
Minimum	7,400	3,500	4,500	300	4,400	200	45,000	52,400	4,500	210
Maximum	15,000	6,750	8,000	900	7,690	600	51,660	67,000	9,310	600
PBAA	9,264	4,339	5,408	449	5,623	323	48,253	59,609	5,584	319
Range	7,600	3,250	3,500	600	3,290	400	6,660	14,600	4,810	390

	11) Deerfield		12) Derry		13) Dracut		14) Dunbarton		15) Goffstown	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	5,527	342	44,913	9,218	34,036	9,536	2,780	227	21,498	4,545
Median	5,560	300	44,500	8,800	34,000	9,000	2,750	200	21,290	4,500
Minimum	4,500	200	40,000	7,400	31,000	7,200	2,250	100	19,000	3,100
Maximum	6,400	600	54,000	12,000	36,395	13,000	3,600	350	25,000	6,000
PBAA	5,543	321	44,706	9,009	34,018	9,268	2,765	214	21,394	4,523
Range	1,900	400	14,000	4,600	5,395	5,800	1,350	250	6,000	2,900

	16) Hampstead		17) Hooksett		18) Lawrence		19) Londonderry		20) Manchester	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	12,470	1,741	16,588	9,109	81,003	37,664	33,039	11,400	118,345	84,364
Median	12,570	2,000	15,000	8,000	80,000	39,000	33,100	12,000	117,000	80,000
Minimum	10,700	1,000	12,600	7,000	75,100	32,300	28,865	8,500	110,000	72,000
Maximum	14,000	2,500	30,000	12,600	89,280	41,000	40,000	16,000	127,000	95,000
PBAA	12,520	1,870	15,794	8,555	80,501	38,332	33,069	11,700	117,672	82,182
Range	3,300	1,500	17,400	5,600	14,180	8,700	11,135	7,500	17,000	23,000

	21) Methuen		22) North Andover		23) Pelham		24) Pembroke		25) Raymond	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	51,335	42,382	32,685	36,782	16,745	3,000	9,031	2,882	13,946	3,625
Median	50,500	41,000	31,000	36,000	17,200	2,600	8,700	3,000	13,500	3,000
Minimum	46,000	37,000	28,000	33,000	13,600	2,100	7,525	2,100	11,600	2,000
Maximum	60,000	50,000	39,600	42,000	20,000	5,000	13,000	4,000	20,000	6,000
PBAA	50,917	41,691	31,842	36,391	16,973	2,800	8,866	2,941	13,723	3,313
Range	14,000	13,000	11,600	9,000	6,400	2,900	5,475	1,900	8,400	4,000

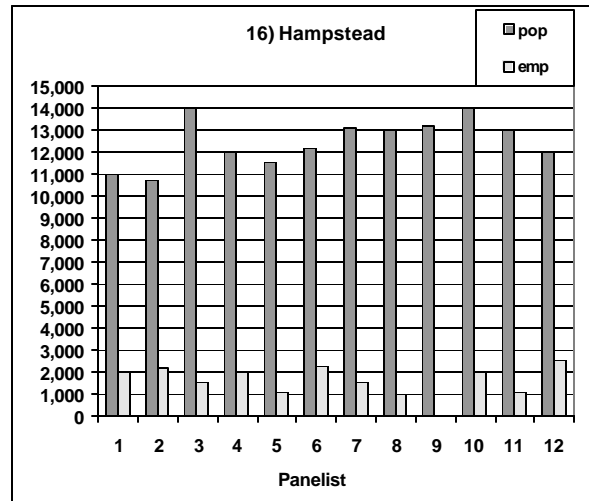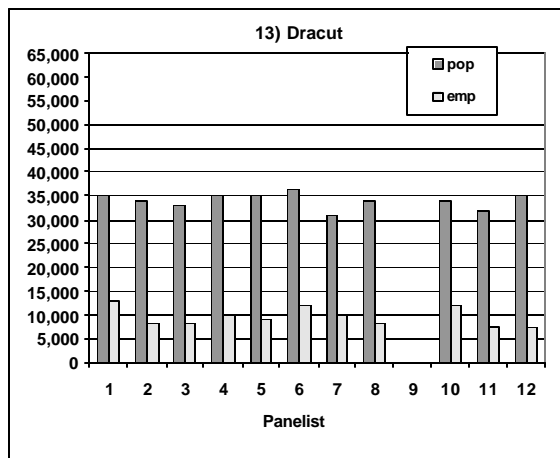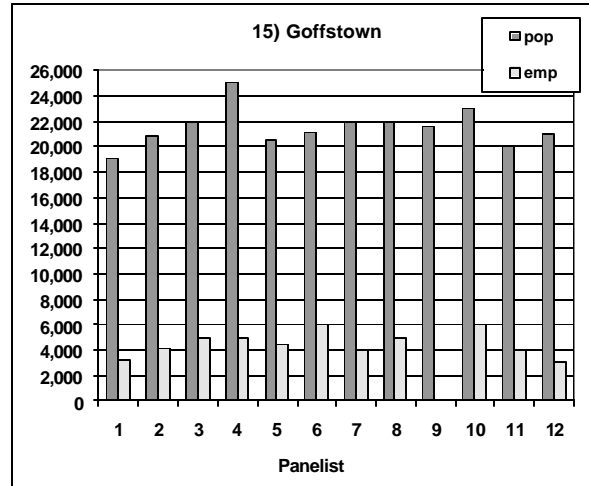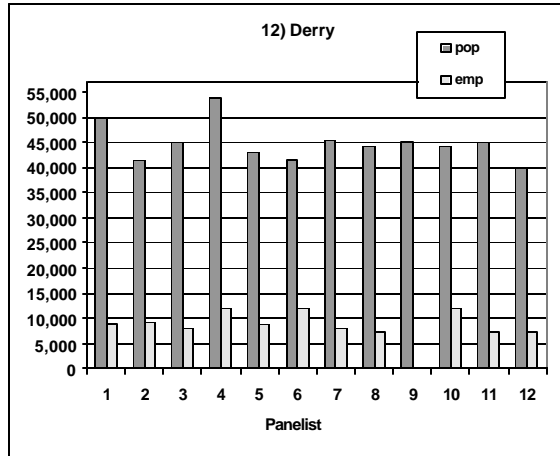|	26) Salem		27) Sandown		28) Tewksbury		29) Windham		TOTAL*	
	pop	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*	*pop*	*emp*
Mean	37,348	17,727	7,628	218	34,784	14,718	15,095	2,273	744,552	400,494
Median	38,200	18,000	8,000	200	34,000	14,000	15,000	1,700	743,000	390,200
Minimum	31,780	14,000	6,000	100	31,900	9,900	13,500	1,200	701,900	349,635
Maximum	41,000	24,000	8,700	350	40,000	24,000	19,000	6,000	863,100	446,640
PBAA	37,774	17,864	7,814	209	34,392	14,359	15,047	1,986	743,044	397,325
Range	9,220	10,000	2,700	250	8,100	14,100	5,500	4,800	161,200	97,005

The PBAA totals for population and employment are created by summing the PBAAs across the 29 zones. Due to rounding, this results in slightly different (less than 1%) figures than would result from deriving the PBAA using the study area total mean and median.
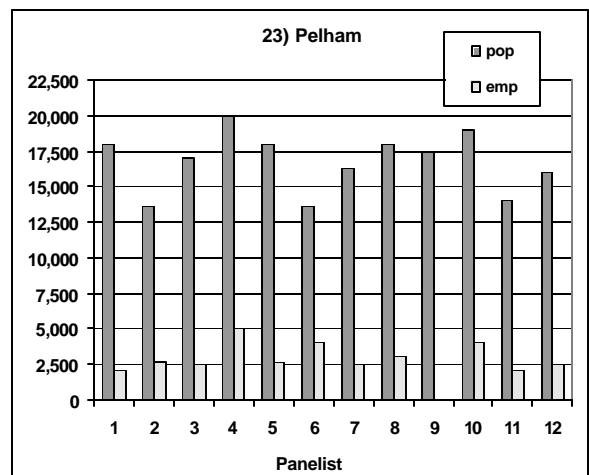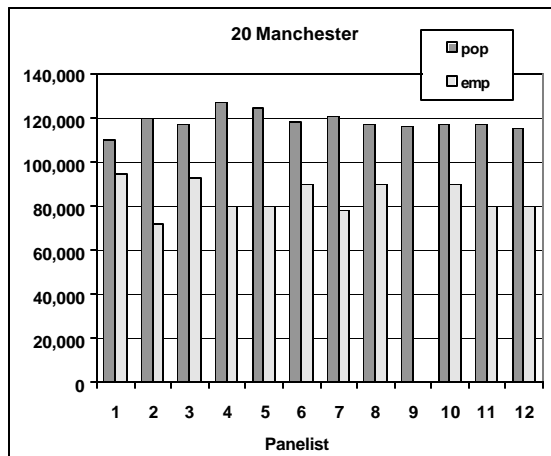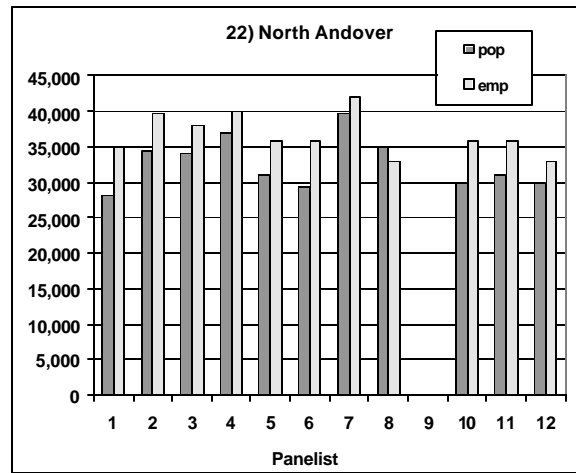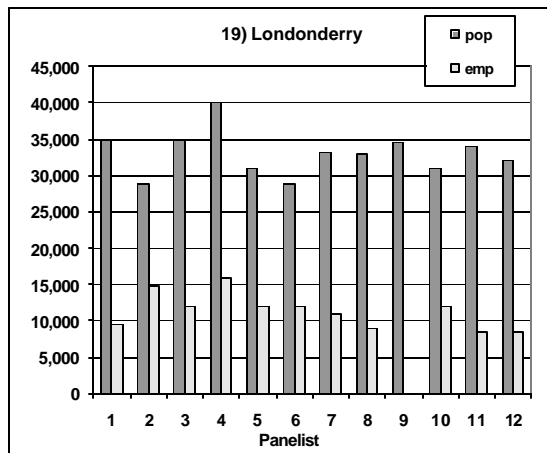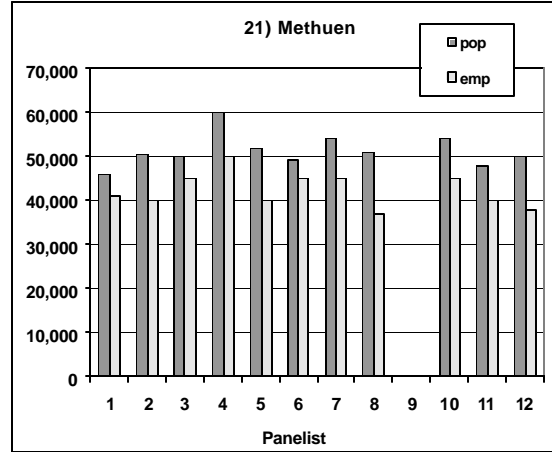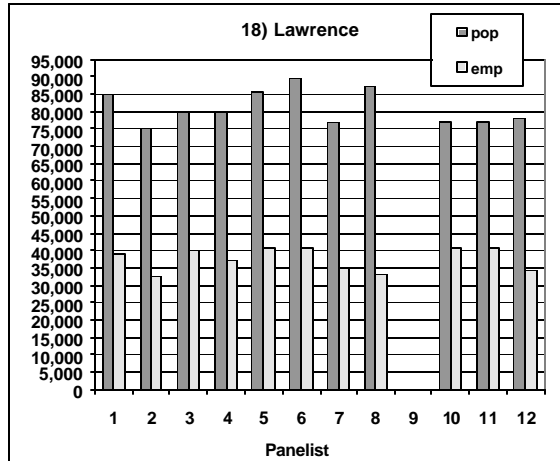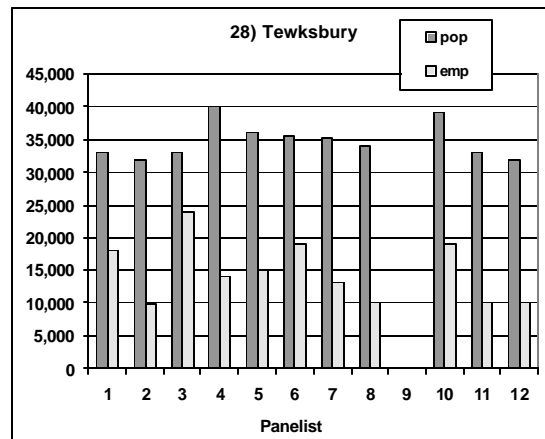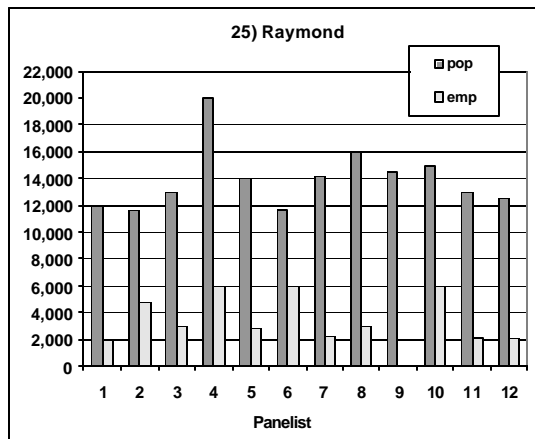
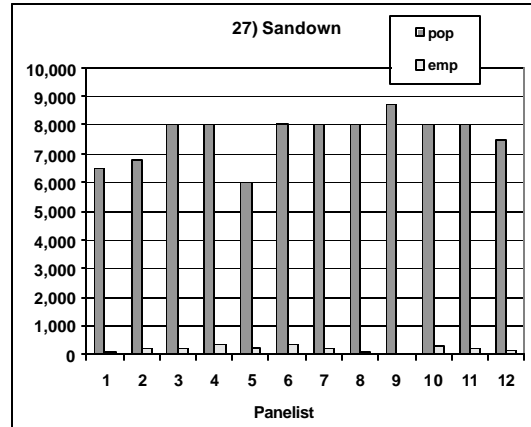# Phase I Allocations by Panelist

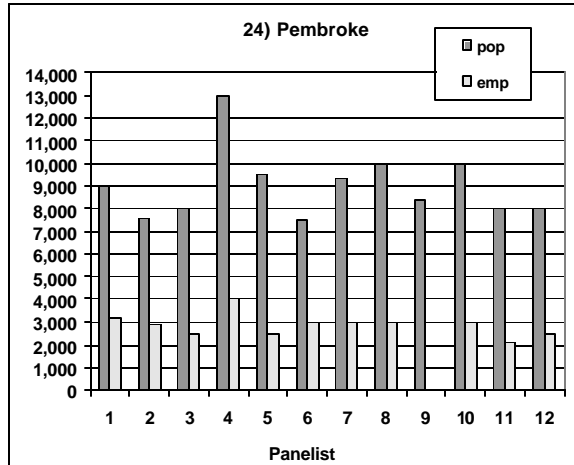This section shows revised panelist allocations for 2020 population and employment by municipality, beginning with the study area as a whole. The last graph shows the allocations for additional municipalities suggested by one of the panelists.

Study Area Total

1) Allenstown

2) Andover

3) Atkinson

4) Auburn

5) Bedford

6) Bow

9) Concord

7) Candia

10) Danville

8) Chester

11) Deerfield

12) Derry

15) Goffstown

13) Dracut

16) Hampstead

14) Dunbarton

17) Hooksett

18) Lawrence

21) Methuen

19) Londonderry

22) North Andover

20 Manchester

23) Pelham

24) Pembroke

27) Sandown

25) Raymond

28) Tewksbury

26) Salem

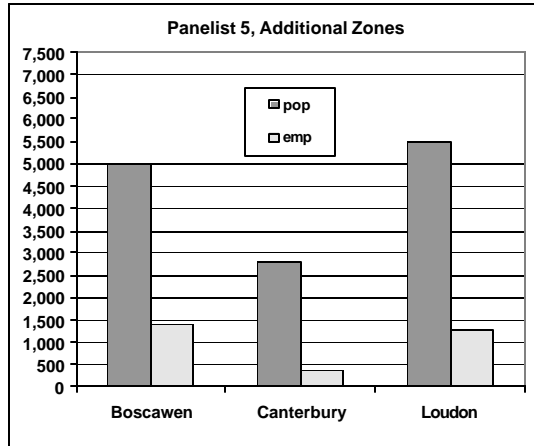29) Windham

Panelist 5, Additional Zones
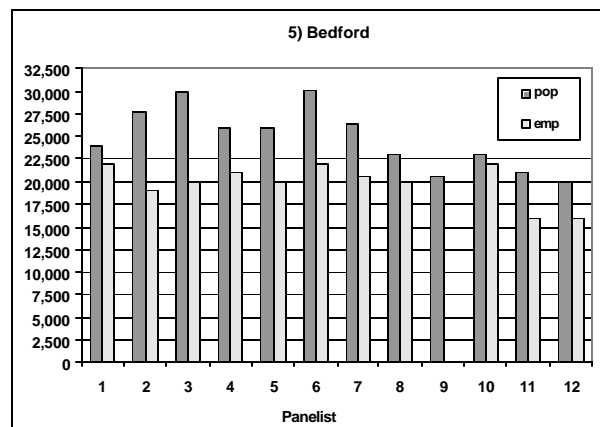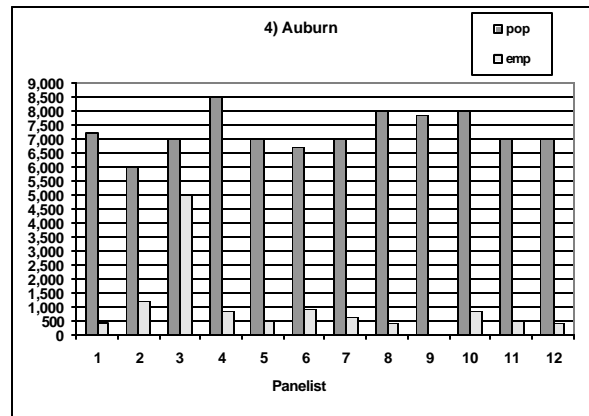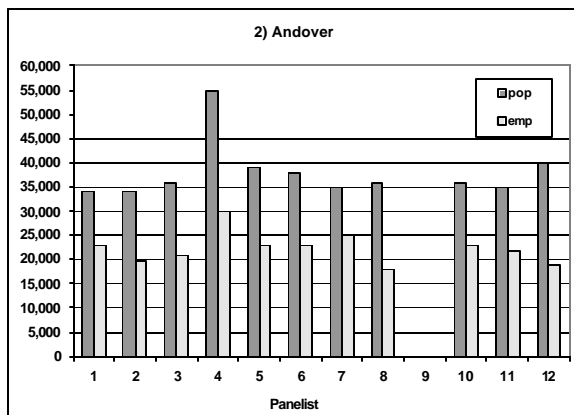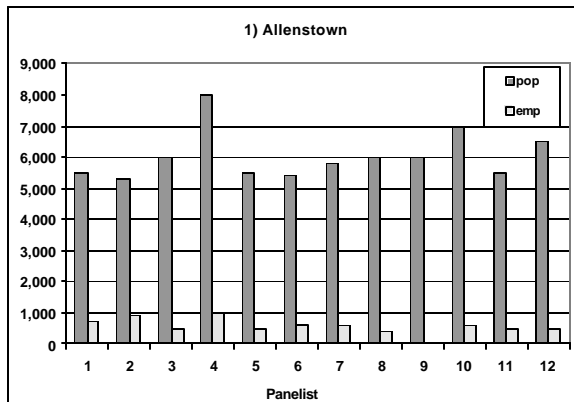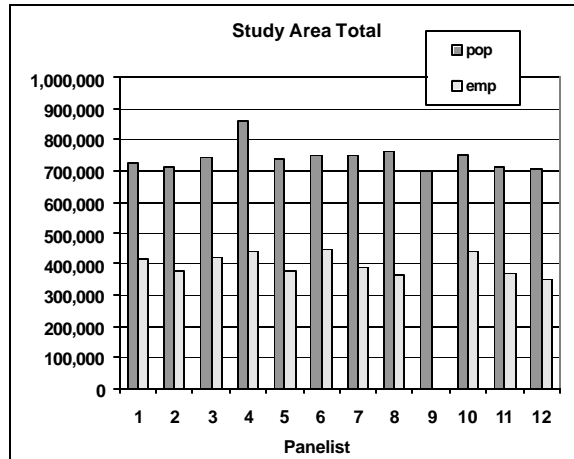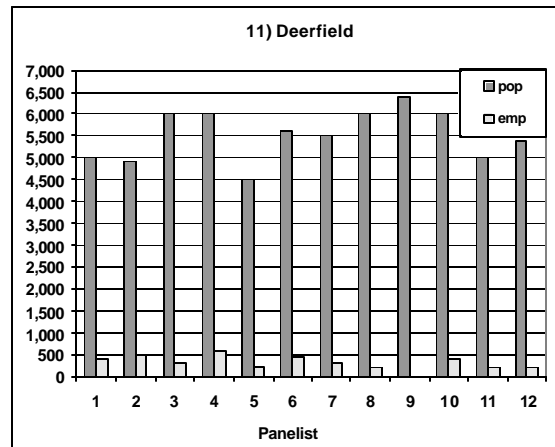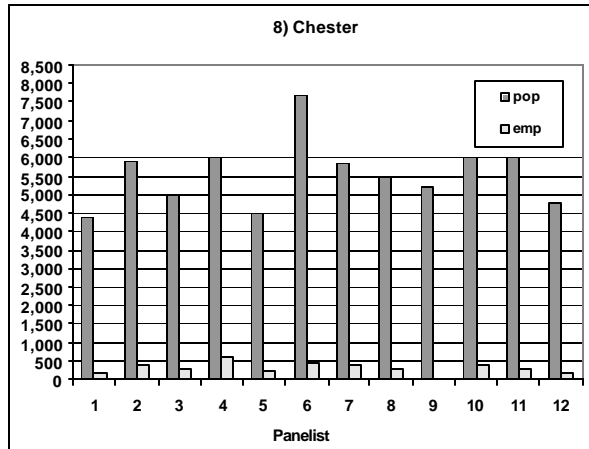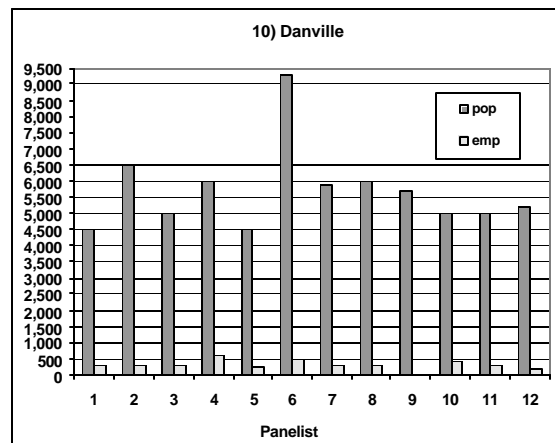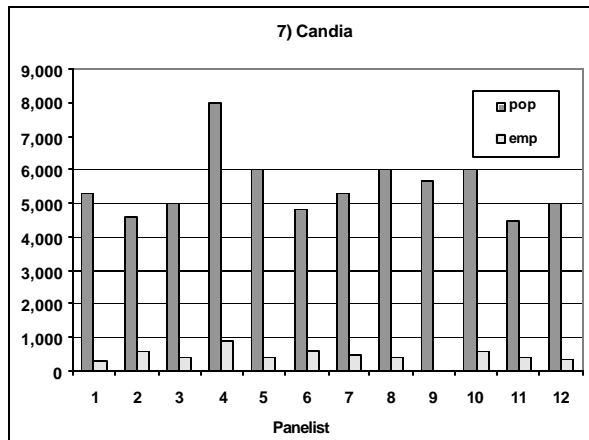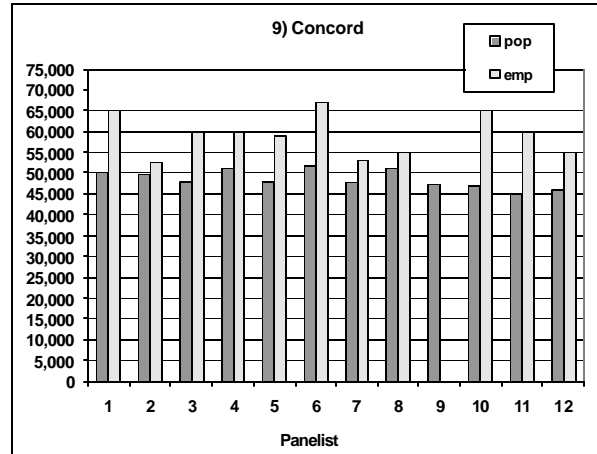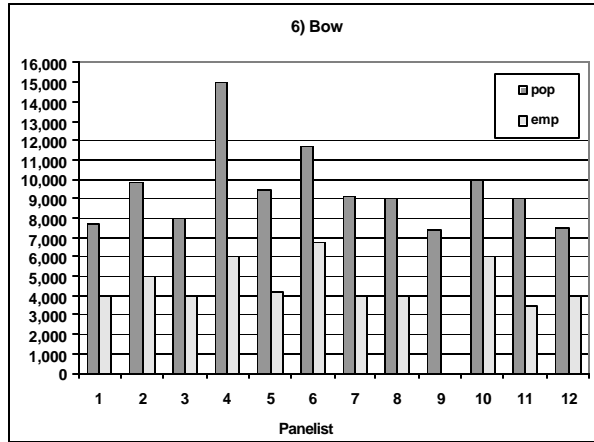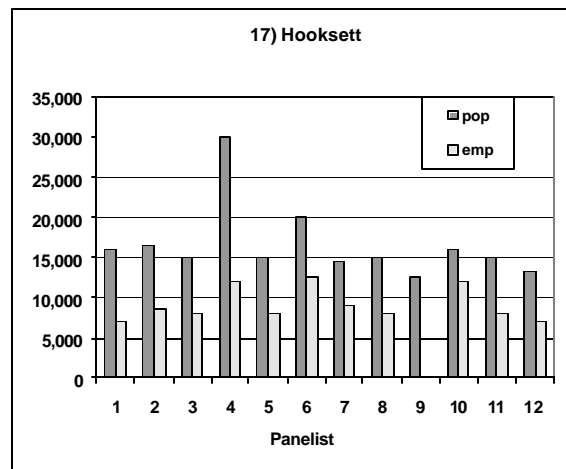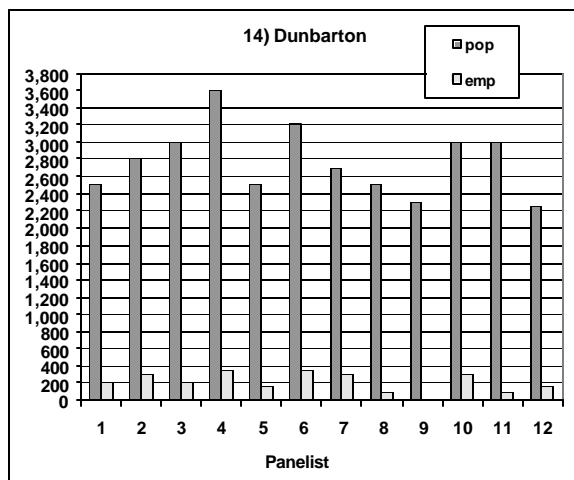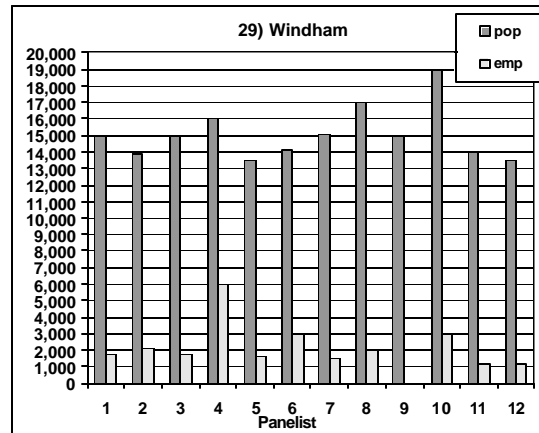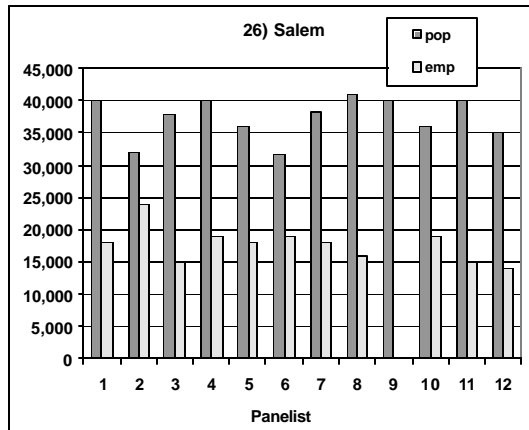
DERIVATION OF THE PANELISTS' BLENDED AVERAGE ALLOCATION

It is useful to present some sort of average of the panel's final allocation in each Phase for each municipality. Rather than use the average (the mean) across responses or the median across responses, we create a "blended average," which is equal to:

(Mean + Median)/2

This measure allows extreme values to be given some weight (unlike a median) but not as much weight as they are given with the mean. The table below compares the mean, median, and the "blended measure." The "blended measure" being what we use for the Panelists' Blended Average Allocation.

This measure is used by the Longview, Texas MPO, which carried out expert panels in 1992 and 1998, and is currently preparing for another. The Longview panels allocate projected population and employment growth to traffic analysis zones for use in the MPO's travel demand model. The Longview panels have been well documented. A thorough description of the 1992 process can be found in *Growth Allocation by the Delphi Process,* Texas Transportation Institute, February 1993, FHWA/TX-92/1235-12.

The table below gives an example of how the blended measure works.

Measures of Central Tendency

	2
	2
	2
	3
Sample Allocations	3
	3
	4
	25
mean	5.5
median	3.0
blended measure	4.3

MEMBERS OF THE EXPERT PANEL

Alan Carpenter	Chair, Windham Planning Board
Dennis Delay	Senior Economist, Public Service of New Hampshire
Thomas Farrelley *	Senior Vice President, Cushman Wakefield Real Estate
Andre Garron	Director of Planning and Economic Development, Londonderry Town Office
Richard Gsottschneider	RKG Associates
Kate Hartnett	Executive Director, NH Comparative Risk Project and the Minimum Impact Partnership
Jim Keller *	Chair, Salem Planning Board
Rick Minard	Deputy Executive Director, NH Center for Public Policy Studies
John Mullin	University of Massachusetts, Department of Landscape Architecture and Regional Planning
David Nelson	Chair, Derry Planning Board
William Norton	Norton Asset Management, Inc.
Ron Poltak	Vice Chair, Manchester Planning Board, New England Interstate Water Pollution Control Commission
Gerry Prunier	Prunier & Leonard
Rob Robertson	University of New Hampshire, Department of Resource Economics and Development
Dan Sundquist	Society for the Protection of NH Forests
Michael Tardiff	Executive Director, Central NH Regional Planning Commission

* Did not remain on panel through entire process.